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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110235U-1

VOLUME 1

OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

NOTE: Refer to Volume 2 (Service Manual) of TM-110235U for maintenance data

1 May 1984
(Rev. 1 July 1984)
(Rev. 1 Sept. 1985)
(Rev. 1 May 1986)
(Rev. 15 May 1987)
(Rev. 1 Sept. 1989)
(Rev.B)

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DRANETZ TECHNOLOGIES, INC.
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Edison, New Jersey 08818

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IMPORTANT! CALIBRATION INTERVAL

The recommended calibration interval for this unit is once every 12 MONTHS.

We recommend that you return the unit to the factory for calibration. If you decide to do so, first contact the Dranetz Customer Service Department to obtain an authorization number.

Telephone Number:	(908) 287-3680
Telex Number:	499-7808
TWX Number:	(908) 997-9553
FAX Number:	(908) 248-9240
Cable:	DRANETZ

Then fill out the Repair/Service Order form enclosed in this manual and ship it along with the unit to the Dranetz Customer Service Department. (If this form is missing, ask the Dranetz Customer Service Department for a replacement.)

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VOLUME 1
OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

SECTION 1
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual, consists of three sections: I) GENERAL INFORMATION, II) INSTALLATION AND OPERATION, and III) OPERATIONAL CHECK. Volume 2, the Service manual, contains the maintenance instructions.

1.2 INTRODUCTION

This manual provides operating instructions for the 626-PA-6003 Plug-in, hereinafter referred to as the 6003, used in the Series 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in Volume 1 of the Mainframe manual.

1.3 PURPOSE

The 6003 monitors disturbances on 3-phase AC power lines with either 50 or 60 Hz nominal frequency. Each phase is monitored on a single voltage range of 0 to 600 V RMS. With thresholds programmed by the user, the 6003 monitors both short and long term power line disturbances. With this plug-in, the unit stores, analyzes, classifies and prints out quantative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The plug-in monitors any 3-phase power line whose RMS values range from a low value of 0 volts to as high as 600 volts. Three types of disturbances are monitored by the 6003: power line frequency, power frequency transients and waveform disturbances. Power frequency transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses", include all conditions that cause the power line waveform to deviate from an ideal waveform. The 6003 measures the peak amplitude of impulses, their polarity and duration. The threshold value of each type of disturbance, as well as the line frequency, above which detection and printout occurs is operator programmable. (All threshold settings are common to all three line phases.) Except for an automatic summary printout at the end of day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of the day. This feature permits long term unattended operation.

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The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

NOTE: Frequency measurements are derived from phase A only. Therefore, if single-phase monitoring is desired, phase A should be used.

1.4 APPLICATIONS

When installed in the 626 mainframe, the 6003 provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the instrument permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

b. To perform pre-installation site surveys. The 6003 can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable instrument, particularly well suited for field use, is ideal for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the instrument provides a clear record of the quality of power supplied during unattended periods.

1.5 EQUIPMENT CHARACTERISTICS

The 6003 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in one of four slots of the Series 626 Universal Disturbance Analyzer. Technical specifications of the 6003 are presented in Table 1-1.

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Table 1-1. 626-PA-6003 Technical Specifications

Input	2 wire differential Z_{in} = 40 Megohms plus 40 pf (each side to ground)
Input Voltage Range	50-600V RMS
Lower Limit of User-Set Voltage (V_{LOW})	50V to 599V
Upper Limit of User-Set voltage (V_{HIGH})	600V to 51V
Voltage Change Sensitivity (V_{SENS}) (1V Increments)	2 to 60V
Line Voltage Measurement Resolution	0.2V
Line Voltage Measurement Accuracy	±1% of reading, ±0.2% of full scale (75V to 600V)
Line Frequency	
Range	45-65 Hz
Resolution	±0.1 Hz
Accuracy	±0.1 Hz
Impulse Range	50-4000V Pk (1-2000 uSec)
Impulse Peak Resolution	1V
Impulse Accuracy	±10% of reading ±1% F.S. (5 uSec-50 uSec.) (decreasing to ±6 dB from 1 uSec to 2 mSec) 100V-4000V
Impulse Duration Range	1 uSec to 2 mSec
Impulse Duration Resolution	1 uSec

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1.6 STANDARD ACCESSORIES

Model No.	Part No.	Quan.	Description
626PA6003-1 (Barrier, Block Connections)	TM110235U (Vol. 1)	1	Operating Manual
626PA6003-2 (Plug-type Connections)	TM110235U (Vol. 1)	1	Operating Manual
	110480-G1	3	A.C. Cables

1.7 OPTIONAL ACCESSORIES

Part No.	Quan.	Description
TM-110235U (Vol. 2)	1	Service (Maintenance Manual)

1.8 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Customer Service Department in order to obtain an Authorization Number.

   Telephone No: (908) 287-3680

   TWX: (908) 997-9553

   FAX: (908) 248-9240

   Telex: 499-7808

   Cable: DRANETZ

2. Fill out the REPAIR/SERVICE ORDER enclosed in this manual and ship it with the malfunctioning equipment to the Dranetz Customer Service Department.

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SECTION II
INSTALLATION AND OPERATION

2.1 INSTALLATION

2.1.1 Selection of Nominal Operation Frequency

Factory set switches in the 6003 optimize the measurements for a nominal frequency of either 50 or 60 Hz. Figure 2-1 locates these switches on the Analog board of the module. Dots on switches on the figure indicate which side of the switch is to be depressed for 60 Hz. For 50 Hz operation, simply reverse all switch positions.

2.1.2 Installation of 6003 in Mainframe

CAUTION: Be sure that all power is removed from the 626 and modules.

a. With the rear panel markings reading correctly, carefully slide the module into the desired slot, with the Digital board within the card-guide tracks until it is firmly seated.

b. Tighten the top and bottom captive screws to secure the module into the mainframe.

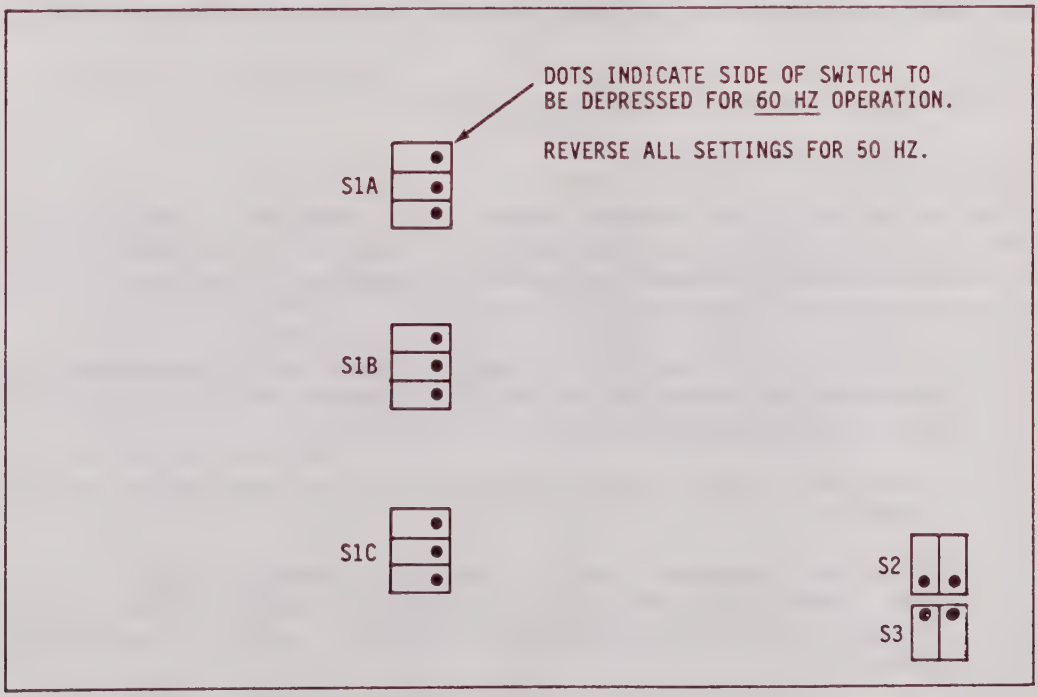

Figure 2-1. Analog Board Switch Locations

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2.1.3 LOAD RATINGS

The Series 626 standard mainframe has an upper limit of the combined total rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating	Plug-in	Load Rating
626-PA-6001	2 Units	626-PA-60012A	3 Units
626-PA-6001 with Extra Option Board	3 Units	626-PA-6013	2 Units
626-PA-6002	2 Units	626-PA-6014	1 Unit
626-PA-6003	4 Units	626-PA-6015	4 Units
626-PA-6005	2 Units	626-PA-6018	4 Units
626-PA-6006	2 Units	626-PA-6020	4 Units
626-PA-6007	1 Unit	626-PA-6024A	4 Units
626-PA-6008	2 Units	626-PA-6024B	4 Units
626-PA-6009	4 Units	626-PA-6025	4 Units
626-PA-6011	1 Unit	626-PA-6030	6 Units
626-PA-6012	2 Units	626-PA-6037	1 Unit
		626-PA-6038	1 Unit
		626-PA-6040	6 Units

NOTE

When selecting modules for installation in any mainframe, verify that the sum of the load ratings of the installed modules DOES NOT exceed 20.

2.2 CONNECTING POWER SOURCE TO MODULE

2.2.1 Connection Procedure

The 6003 is equipped with either three rear panel AC connectors, or a barrier block. Inputs include phase A, B, and C. Connectors must be wired in accordance with the rear panel connector markings (AC high, AC low, and earth ground from top to bottom).

a. Turn the 626 off by inserting the key in FUNCTION key switch on front panel of mainframe and setting the switch to the OFF position.

b. Turn off power source that is to be monitored by the module.

c. Make all connections to the 6003 module first. If the 6003 has been supplied with connectors, merely insert the mating connector, supplied with the unit, until a "click" is heard.

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If the 6003 has been supplied with a barrier block, make all connections to the barrier block first, then be sure to replace the barrier block cover. DO NOT PROCEED UNTIL PARAGRAPH C IS COMPLETE.

d. Make the desired connections to the power source to be monitored.

e. Power up the 626 by turning the FUNCTION key switch to the OPERATE position.

f. Turn on power source to be monitored.

WARNING: Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) and/or any other requirements applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

CAUTION: To avoid damaging the equipment, do not apply AC voltages in excess of 600V RMS to any AC phase input (A,B, or C) of the 6003.

2.2.2 Circuit Applications

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

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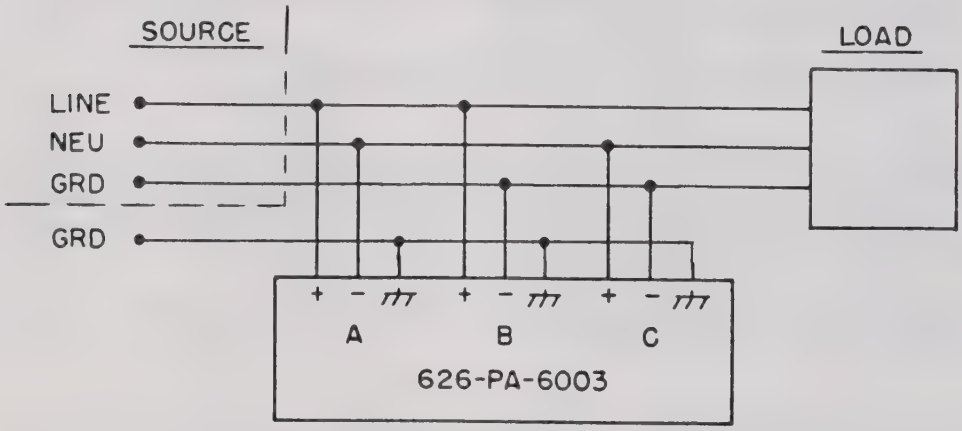
The 3-phase AC monitor for 45-65 Hz may be used for 30 Wye, 30 Delta, or for up to three separate AC signals. It may be used by itself to do Normal Mode/Common Mode analysis on 1 phase lines, or in combination with a 626-PA-6006 to do Normal Mode/Common Mode analysis on a 3 phase wye line.



1 Phase Normal Mode/Common Mode

Readings:

Channel A: LINE-Neutral
Channel B: LINE-Ground
Channel C: Neutral-Ground

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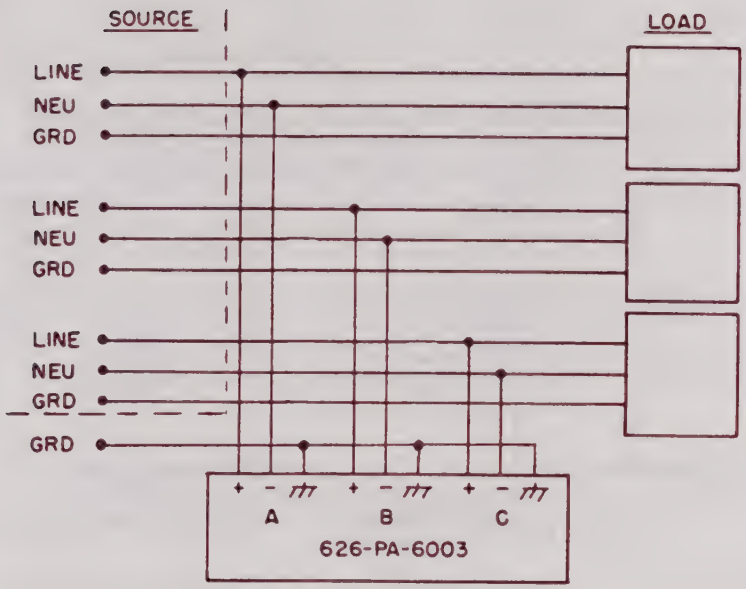
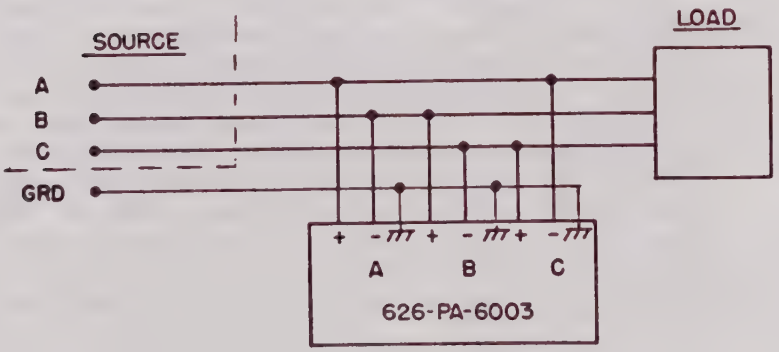


3 Separate AC Lines

Notes

1. All Channels are monitored independently.
2. All line frequencies must be the same.
3. All 3 channels will have same program set-up.



3 Phase Delta

Notes

1. Delta may be grounded or ungrounded
2. Set 626-PA-6003 to monitor line-to-line voltage e.g.: For 240 volt delta, set High and Low Limits to either side of 240 VAC.

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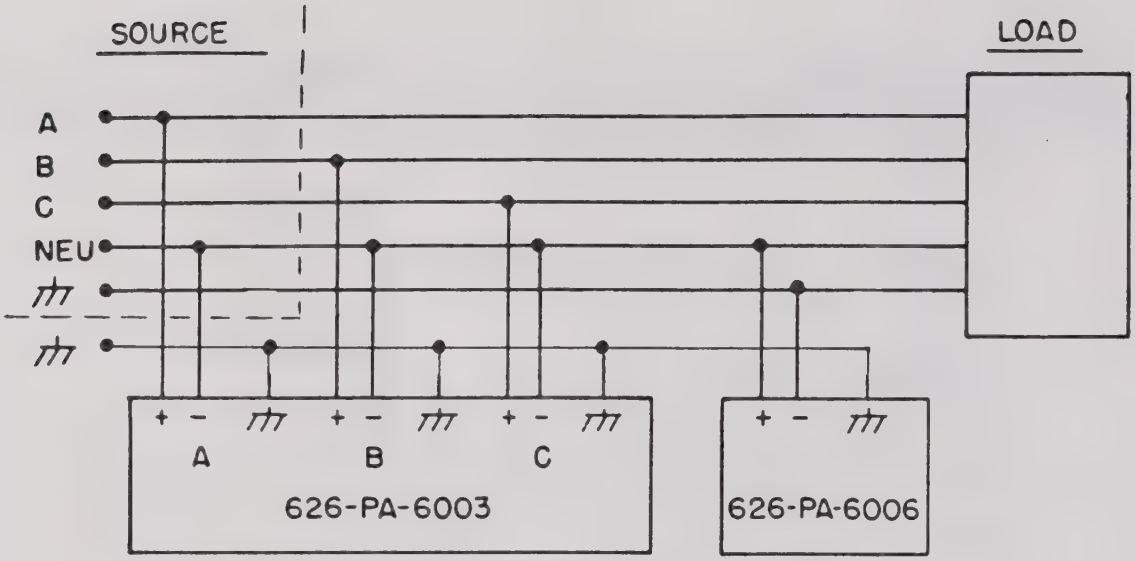

3 Phase Wye

Notes

1. 626-PA-6006 is added to perform Neutral-Ground (COMMON mode) monitoring.

2. Wye distribution is normally monitored Line-to-Neutral, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 120.

3. To monitor wye system line-to-line, set High and Low Limits to either side of higher stated voltage, and connect to 626-PA-6003 as though lines A, B, and C were from a delta, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 208.

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2.2.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious Impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of Impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade Potential Transformers for monitoring Impulses on high voltage power lines is not recommended. The limited frequency response of most Potential Transformers may result in substantial variation of Impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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2.3 OPERATING THE 6003

2.3.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6003 operation are described in Table 2-1. Figure 2-2 shows the Series 626 controls used by the 6003 module. For a description of controls common to overall Model 626 operation, refer to Volume 1 of the Mainframe manual.

2.3.2 Programming Procedure

Assume it is desired to program a high limit of 125V, a low limit of 105V, voltage sensitivity of 2 volts, frequency sensitivity of 0.2 Hz and an impulse sensitivity of 50V. Voltage and frequency sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 25 volts, a disturbance is recorded when impulse amplitude rises above 25 volts.

NOTE

1. It is recommended that the HI and LO limits be set to at least 3V (respectively) from the nominal voltage being measured. For example, if monitoring 120V, the high and low limits should be 117V (or less) and 123V (or more), respectively.

2. It is also recommended that the sensitivity be set to at least 2% of the nominal input voltage.

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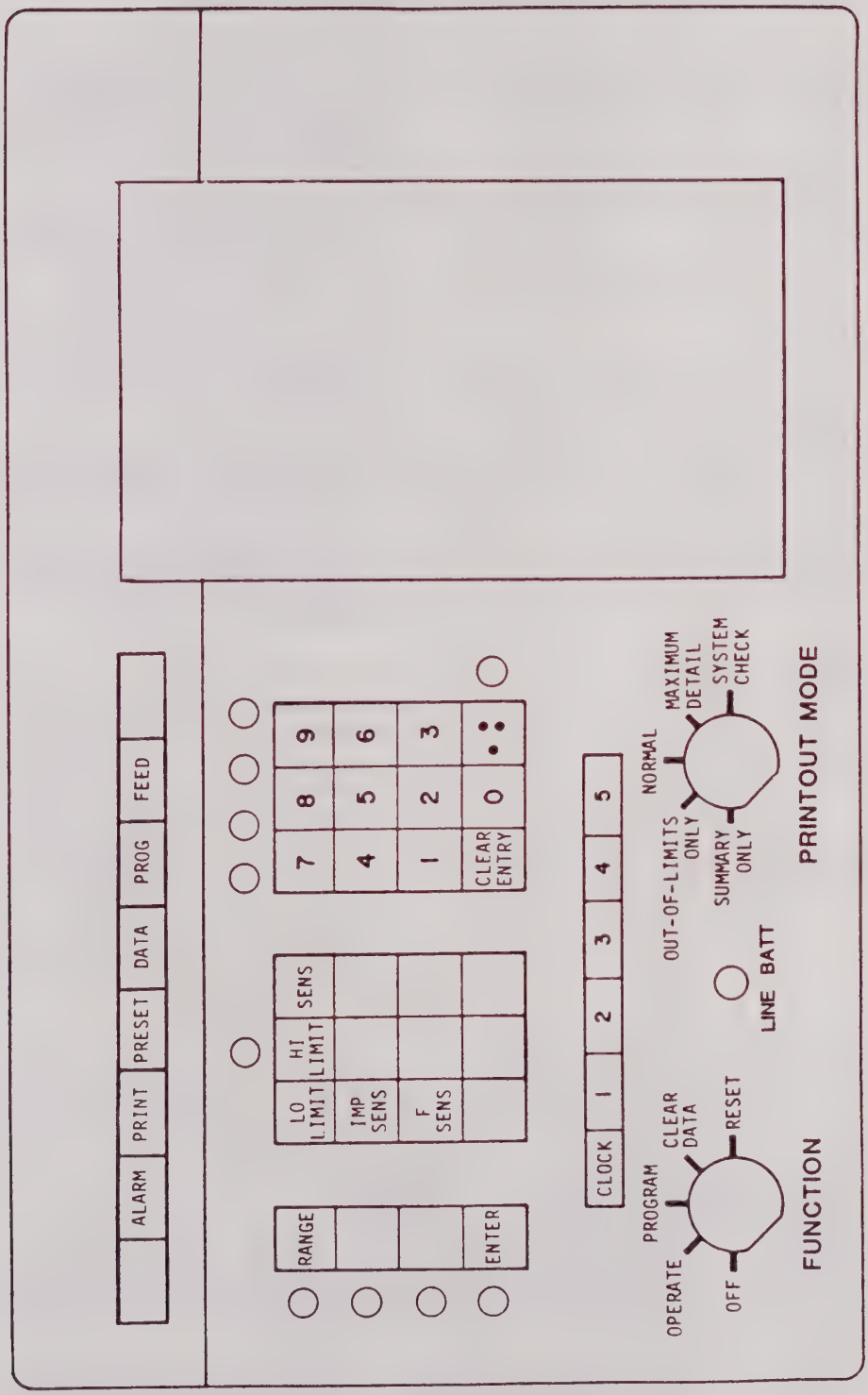

Figure 2-2. Series 626 Controls Used by the 6003 Plug-In

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Table 2-1. 6003 Operating Controls

Item	Function
LO LIMIT pushbutton	When depressed, enables numeric keyboard to program low limit voltage.
HI LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
F SENS pushbutton	When depressed, enables numeric keyboard to program frequency sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6003 memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel.

For the example cited, program the 6003 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that a cueing indicator above the center bank of pushbuttons lights. This indicates that a function may be programmed.

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d. Depress the HI LIMIT pushbutton. Program the high limit value (125), using the keyboard.

e. When the ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout and the ENTER indicator will go out.

f. Repeat steps c, d and e for the low limit voltage (105V) using the LO LIMIT pushbutton.

g. Repeat steps c, d and e for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 02.

h. Repeat steps c, d and e for the frequency sensitivity (0.2 Hz), using the F SENS pushbutton and programming the value as 0.2.

i. Repeat steps c, d and e for the impulse sensitivity (0050 volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

626	
IMPULSE SENS	0050V
FREQ SENS	00.2 HZ
VOLTAGE SENS	002 V
V LOW LIMIT	105 V
V HIGH LIMIT	125 V
626-PA-6003	
CH 4	

626A,G,R,ARA	
CH 4	
626-PA-6003	
V HIGH LIMIT	125V
V LOW LIMIT	105V
VOLTAGE SENS	002 V
FREQ SENS	00.2 HZ
IMPULSE SENS	0050V

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits.

j. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

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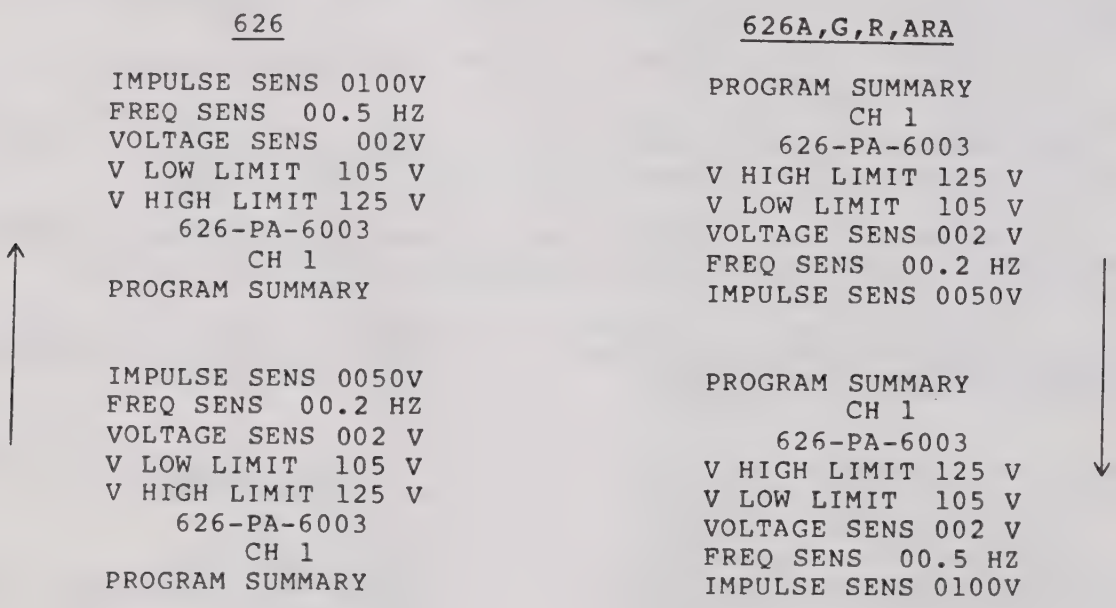
2.4 SELECTING THE FACTORY PRESET PROGRAM

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below. The printout group generated first is the operator program; the second is the factory program printed after the PRESET button is pressed.



2.5 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6003, it is recorded and displayed in characteristic manner.

2.5.1 Overvoltage

An overvoltage condition exists when the monitored power line voltage exceeds the user-specified upper limit for more than 2.55 seconds. An overvoltage condition is indicated by a printout such as the following:

4B HI 09:46:07.11

where 4 is the channel number, B is the phase and time is given in hours, minutes and seconds (to .01 sec resolution).

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When the line voltage recovers to normal, a printout such as the following occurs:

626	626A,G,R,ARA
4B NOR Ø9:46:15.2Ø 148.6 V MAX	148.6 V MAX 4B NOR Ø9:46:15.2Ø

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

2.5.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. An undervoltage condition is indicated by a printout such as the following:

```
4C  LO   Ø9:46:15.2Ø
```

When the line voltage returns to normal level, a message such as the following is printed:

626	626A,G,R,ARA
4C NOR Ø9:46:18.45 36.4 V MIN	36.4 V MIN 4C NOR Ø9:46:18.45

indicating when normal voltlage was restored and the value of the lowest voltage reached during the undervoltage interval.

2.5.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected integer voltage between one and 15 volts for a 115-volt line. The following example shows several voltage change printouts. The first shows that Phase A voltage in channel 3 decreased to 109.2V at time shown. The second printout shows that phase C voltage increased to 115.4V at time shown.

626	626A,G,R,ARA
2C INC Ø1:Ø2:34.56 115.4 V 3A DEC Ø1:Ø2:34.56 1Ø9.2 V	115.4 V 2C INC Ø1:Ø2:34.56 1Ø9.2 V 3A DEC Ø1:Ø2:34.56

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2.5.4 Voltage Surge

A Voltage Surge is defined as a line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
4B   HI   09:45:33.15
```

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

626	626A,G,R,ARA
↑ 4B NOR 09:45:33.38	SURGE 0.23 SEC
128.2 V MAX	128.2 V MAX
SURGE 0.23 SEC	4B NOR 09:45:33.38 ↓

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

2.5.5 Voltage Sag

A voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

NOTE

Voltage inputs less than 25V RMS will be printed out as 0.0V on the 6003.

2.5.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

626	626A,G,R,ARA
↑ 2A IMP 10:12:13.45	+0139 V, 0010 US
+0139 V, 0010 US	2A IMP 10:12:13.45 ↓

This printout indicates that an impulse which deviated from normal line voltage by +139 volts peak and whose duration was 10 microseconds was detected on phase A of Channel 2 at the time shown. The impulse magnitude is measured with respect to the instantaneous point on the power frequency sinewave at which it occurs. Impulse polarity is referenced to "+" and "-" markings on rear panel.

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2.5.7 Frequency Change

A frequency change printout is triggered when the line frequency changes more than a preselected amount from the last printed value. The frequency change sensitivity is a user-selected value between 0.2 Hz and 3.0 HZ in 0.1 HZ increments. The following example shows several frequency change printouts.

626	626A,G,R,ARA
3 FRQ 10:16:27.02	060.5 HZ
060.5 HZ	3 FRQ 10:16:27.02
3 FRQ 10:16:24.32	060.0 HZ
060.0 HZ	3 FRQ 10:16:24.32
3 FRQ 10:16:17.02	059.5. HZ
059.5 HZ	3 FRQ 10:16:17.02

2.6 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise. The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in phase A of Channel 1 and that the limits for Channel 1 were programmed as follows:

V LOW LIMIT	105 Vrms
V HIGH LIMIT	125 Vrms
V SENSITIVITY	2 Vrms

The example printouts are referenced to figures 2-3 and 2-4 which illustrate overvoltage and voltage sag disturbances, respectively.

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

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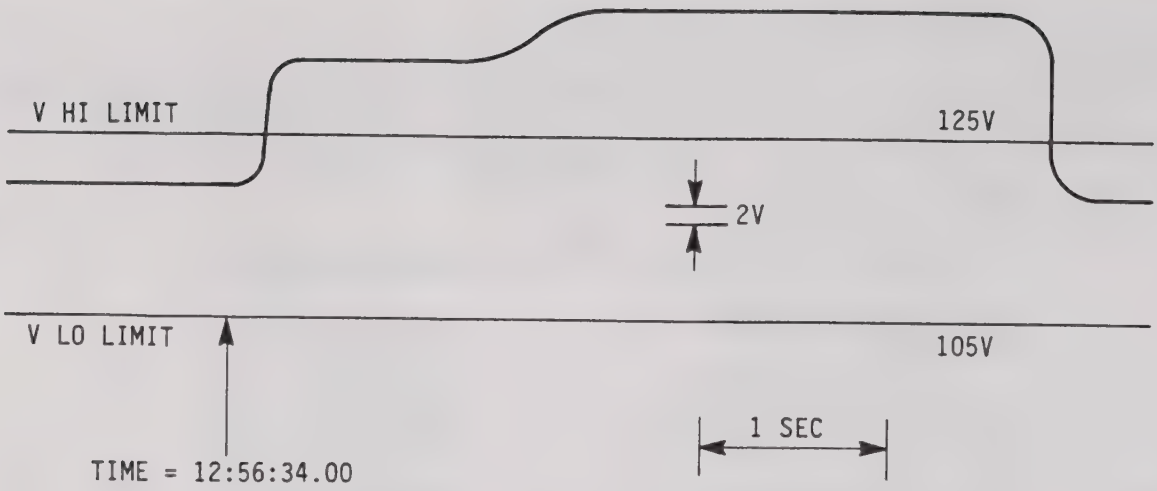

Figure 2-3. Overvoltage Disturbance (6003)

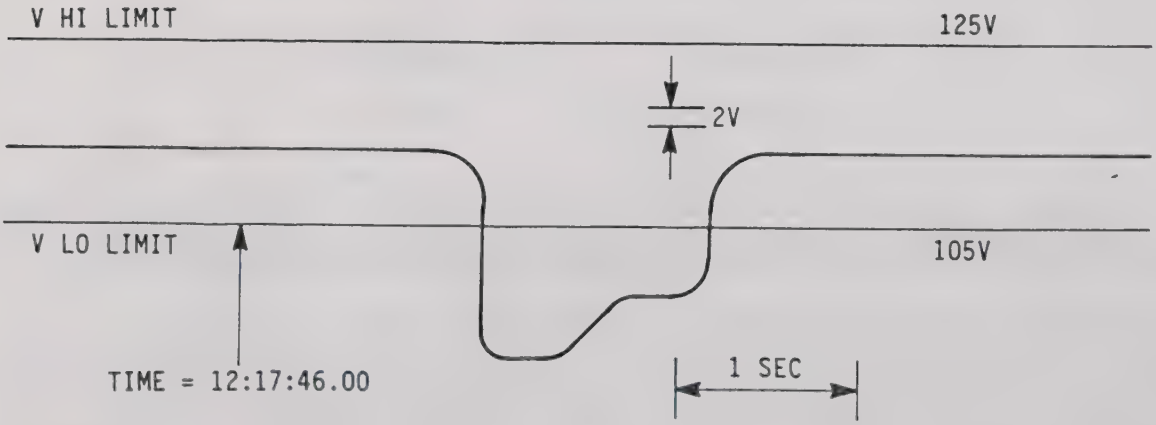

Figure 2-4. Voltage Sag Disturbance (6003)

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The first printout group generated below illustrates overvoltage (fig. 2-3) in the NORMAL mode. The second (3-line) group illustrates overvoltage in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:56:38.51
    139.1  V  MAX

1A  HI    12:56:34.21


1A  NOR   12:56:38.51
    139.1  V  Max

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3 V

1A  INC   12:56:35.62
    135.3 V

1A  INC   12:56:35.40
    133.3 V

1A  INC   12:56:34.22
    131.3 V

1A  INC   12:56:34.21
    129.2 V

1A  HI    12:56:34.21
```

626A,G,R,ARA

```
1A  HI    12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V   MAX
1A  NOR   12:56:38.51


1A  HI    12:56:34.21

    139.1  V   MAX
1A  NOR   12:56:38.51
```

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The following is a printout of overvoltage (fig. 2-3) in the MAXIMUM DETAIL mode.

626			626A		
1A	DEC	12:56:38.61		119.0 V	
	119.8 V		1A	INC	12:50:12.34
1A	DEC	12:56:38.53		121.1 V	
	121.8 V		1A	INC	12:56:34.20
1A	DEC	12:56:38.51	1A	HIGH	12:56:34.21
	124.0 V			129.2 V	
1A	NORM	12::56:38.51	1A	INC	12:56:34.21
	139.1 V MAX			131.3 V	
1A	DEC	12:56:38.50	1A	INC	12:56:34.22
	130.2 V			133.3 V	
1A	INC	12:56:35.78	1A	INC	12:56:35:40
	137.3			135.3 V	
1A	INC	12:56:35.62	1A	INC	12:56:35.62
	135.3 V			137.3 V	
1A	INC	12:56:35.40	1A	INC	12:56:35.78
	133.3 V			130.2 V	
1A	INC	12:56:34.22	1A	DEC	12:56:38.50
	131.3 V			139.1 V	
1A	INC	12:56:34.21	1A	NORM	12:56:38.51
	129.2 V			124.0 V	
1A	HIGH	12:56:34.21	1A	DEC	12:56:38.51
1A	INC	12:56:34.20		121.8 V	
	121.1 V		1A	DEC	12:56:38.53
1A	INC	12:50:12.34		119.8 V	
	119.0 V		1A	DEC	12:56:38.61

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The first group of generated printouts below illustrates voltage sag (fig. 2-4) in the NORMAL mode. The second group illustrates voltage sag in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:17:48.61
    090.1  V  MIN
    SAG  1.25 SEC

1A  LOW   12:17:47.36


1A  NORM  12:17:48.61
    090.1   V  MIN
    SAG   1.25 SEC

1A  INC   12:17:48.60
    103.1  V

1A  INC  12:17:48.55
    098.0  V

1A  INC   12:17:48.05
    096.0  V

1A  INC   12:17:47.96
    094.0  V

1A  DEC   12:17:47.39
    091.9  V

1A  DEC   12:17:47.37
    094.1  V

1A  DEC   12:17:47.36
    101.3  V

1A  LOW   12:17:47.36
```

626A,G,R,ARA

```
1A  LOW    12:17:47.36

    101.3   V
1A  DEC    12:17:47.36

    094.1   V
1A  DEC    12:17:47.37

    091.9   V
1A  DEC    12:17:47.39

    094.0   V
1A  INC    12:17:47.96

    096.0   V
1A  INC    12:17:48.05

    098.0   V
1A  INC    12:17:48.55

    103.1   V
1A  INC    12:17:48.60

    SAG   1.25 SEC
    090.1   V  MIN
1A  NORM   12:17:48.61


1A   LOW   12:17:47.36

     SAG  1.25 SEC
     090.1  V   MIN
1A   NOR   12:17:48.61
```

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The following printout illustrates voltage sag (fig. 2-4) in the MAXIMUM DETAIL mode.

626

```
1A  DEC   12:27:48.86
    112.1  V

1A  INC   12:17:48.69
    110.0  V

1A  INC   12:17:48.62
    108.1  V

1A  INC   12:17:48.61
    105.9

1A  NORM  12:17:48.61
    090.1   V  MIN
    SAG   1.25  SEC

1A  INC   12:17:48.60
    103.1  V

1   INC   12:17:48.55
    098.0  V

1A  INC   12:17:48.05
    096.0  V

1A  INC   12:17:47.96
    094.0  V

1A  DEC   12:17:47.39
    091.9  V

1A  DEC   12:17:47.37
    094.1  V

1A  DEC   12:17:47.36
    101.3  V

1A  LOW   12:17:47.36

1A  DEC   12:17:47.35
    110.8  V

1A  INC   12:16:32.15
    113.0  V
```

626A,G,R,ARA

```
    113.0   V
1A  INC     12:16:32.15

    110.8   V
1A  DEC     12:17:47.35

1A  LOW     12:17:47.36

    101.3   V
1A  DEC     12:17:47.36

    094.1   V
1A  DEC     12:17:47.37

    091.9   V
1A  DEC     12:17:47.39

    094.0   V
1   INC     12:17:47.96

    096.0   V
1A  INC     12:17:48.05

    098.0   V
1A  INC     12:17:48.55

    103.1   V
1A  INC     12:17:48.60

    SAG   1.25  SEC
    090.1   V   MIN
1A  NORM    12:17:48.61

    105.9   V
1A  INC     12:17:48.61

    108.1   V
1A  INC     12:17:48.62

    110.0   V
1   INC     12:17:48.69

    112.1   V
1   INC     12:27:48.86
```


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SECTION III
OPERATIONAL TEST

3.1 GENERAL

This section provides information for performing an operational test to verify that the 6003 plug-in is operating properly.

3.2 SYSTEM CHECK

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6003. Any inputs connected at this time will be automatically disconnected during the system check period. Successful measurement of these signals verifies that the module is fully operational. Expected system check measurement results and allowable tolerances are listed below.

AC Voltage	196.0-204.0 Volts
Impulse Peak	2700-3300 Volts
Impulse Duration	360-440 uSec
Frequency	59.8-60.2 Hz

3.3 SAMPLE SYSTEM CHECK PRINTOUT

A typical system check printout obtained from a 6006 plug-in is illustrated below.

<u>626</u>

```
******************


IMP- 3008V, 0396US
AC VOLTS    199.4V
      PH C
IMP- 3064V, 0395US
AC VOLTS    199.5V
      PH B
IMP- 3103V, 0397US
AC VOLTS    199.8V
      PH A
FRQ    060.0 HZ
   626-PA-6003
      CH 4

TIME = 00:00:12.10
***SYSTEM CHECK***
```

<u>626A,G,R,ARA</u>

```
***SYSTEM CHECK***
TIME = 00:00:12.10

      CH 4
   626-PA-6003
FRQ    060.0 HZ
      PH A
AC VOLTS    199.8V
IMP- 3103V, 0397US
      PH B
AC VOLTS    199.5V
IMP- 3064V, 0395US
      PH C
AC VOLTS    199.4V
IMP- 3008V, 0396US


******************
```

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1001400

WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110235U-1

VOLUME 1

OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

NOTE: Refer to Volume 2 (Service Manual) of TM-110235U for maintenance data

1 May 1984
(Rev. 1 July 1984)
(Rev. 1 Sept. 1985)
(Rev. 1 May 1986)
(Rev. 15 May 1987)
(Rev. 1 Sept. 1989)
(Rev.B)

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IMPORTANT! CALIBRATION INTERVAL

The recommended calibration interval for this unit is once every 12 MONTHS.

We recommend that you return the unit to the factory for calibration. If you decide to do so, first contact the Dranetz Customer Service Department to obtain an authorization number.

Telephone Number:	(908) 287-3680
Telex Number:	499-7808
TWX Number:	(908) 997-9553
FAX Number:	(908) 248-9240
Cable:	DRANETZ

Then fill out the Repair/Service Order form enclosed in this manual and ship it along with the unit to the Dranetz Customer Service Department. (If this form is missing, ask the Dranetz Customer Service Department for a replacement.)

STATEMENT OF WARRANTY

ALL PRODUCTS OF DRANETZ TECHNOLOGIES, INC. ARE WARRANTED TO THE ORIGINAL PURCHASER AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. DRANETZ WILL REPAIR OR REPLACE, AT ITS OPTION, ALL DEFECTIVE EQUIPMENT RETURNED, FREIGHT PREPAID, DURING THE WARRANTY PERIOD, WITHOUT CHARGE FOR REPAIR, PROVIDED THERE IS NO EVIDENCE THAT THE EQUIPMENT HAS BEEN MISHANDLED OR ABUSED. THIS WARRANTY SHALL NOT APPLY TO ANY DEFECTS RESULTING FROM IMPROPER OR INADEQUATE MAINTENANCE, BUYER-SUPPLIED HARDWARE/SOFTWARE OR INTERFACING, UNAUTHORIZED MODIFICATION OR MISUSE OF THE EQUIPMENT, OPERATION OUTSIDE OF THE ENVIRONMENTAL SPECIFICATIONS FOR THE PRODUCT, OR IMPROPER SITE PREPARATION OR MAINTENANCE.

The information in this manual has been reviewed and is believed to be entirely reliable. No responsibility, however, is assumed for any inaccuracies. The material in this manual is for information purposes only, and is subject to change without notice.

VOLUME 1
OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

SECTION 1
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual, consists of three sections: I) GENERAL INFORMATION, II) INSTALLATION AND OPERATION, and III) OPERATIONAL CHECK. Volume 2, the Service manual, contains the maintenance instructions.

1.2 INTRODUCTION

This manual provides operating instructions for the 626-PA-6003 Plug-in, hereinafter referred to as the 6003, used in the Series 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in Volume 1 of the Mainframe manual.

1.3 PURPOSE

The 6003 monitors disturbances on 3-phase AC power lines with either 50 or 60 Hz nominal frequency. Each phase is monitored on a single voltage range of 0 to 600 V RMS. With thresholds programmed by the user, the 6003 monitors both short and long term power line disturbances. With this plug-in, the unit stores, analyzes, classifies and prints out quantative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The plug-in monitors any 3-phase power line whose RMS values range from a low value of 0 volts to as high as 600 volts. Three types of disturbances are monitored by the 6003: power line frequency, power frequency transients and waveform disturbances. Power frequency transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses", include all conditions that cause the power line waveform to deviate from an ideal waveform. The 6003 measures the peak amplitude of impulses, their polarity and duration. The threshold value of each type of disturbance, as well as the line frequency, above which detection and printout occurs is operator programmable. (All threshold settings are common to all three line phases.) Except for an automatic summary printout at the end of day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of the day. This feature permits long term unattended operation.

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The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

NOTE: Frequency measurements are derived from phase A only. Therefore, if single-phase monitoring is desired, phase A should be used.

1.4 APPLICATIONS

When installed in the 626 mainframe, the 6003 provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the instrument permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

b. To perform pre-installation site surveys. The 6003 can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable instrument, particularly well suited for field use, is ideal for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the instrument provides a clear record of the quality of power supplied during unattended periods.

1.5 EQUIPMENT CHARACTERISTICS

The 6003 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in one of four slots of the Series 626 Universal Disturbance Analyzer. Technical specifications of the 6003 are presented in Table 1-1.

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Table 1-1. 626-PA-6003 Technical Specifications

Input	2 wire differential Z_{in} = 40 Megohms plus 40 pf (each side to ground)
Input Voltage Range	50-600V RMS
Lower Limit of User-Set Voltage (V_{LOW})	50V to 599V
Upper Limit of User-Set voltage (V_{HIGH})	600V to 51V
Voltage Change Sensitivity (V_{SENS}) (1V Increments)	2 to 60V
Line Voltage Measurement Resolution	0.2V
Line Voltage Measurement Accuracy	±1% of reading, ±0.2% of full scale (75V to 600V)
Line Frequency	
Range	45-65 Hz
Resolution	±0.1 Hz
Accuracy	±0.1 Hz
Impulse Range	50-4000V Pk (1-2000 uSec)
Impulse Peak Resolution	1V
Impulse Accuracy	±10% of reading ±1% F.S. (5 uSec-50 uSec.) (decreasing to ±6 dB from 1 uSec to 2 mSec) 100V-4000V
Impulse Duration Range	1 uSec to 2 mSec
Impulse Duration Resolution	1 uSec

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1.6 STANDARD ACCESSORIES

Model No.	Part No.	Quan.	Description
626PA6003-1 (Barrier, Block Connections)	TM110235U (Vol. 1)	1	Operating Manual
626PA6003-2 (Plug-type Connections)	TM110235U (Vol. 1)	1	Operating Manual
	110480-G1	3	A.C. Cables

1.7 OPTIONAL ACCESSORIES

Part No.	Quan.	Description
TM-110235U (Vol. 2)	1	Service (Maintenance Manual)

1.8 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Customer Service Department in order to obtain an Authorization Number.

   Telephone No: (908) 287-3680
   TWX: (908) 997-9553
   FAX: (908) 248-9240
   Telex: 499-7808
   Cable: DRANETZ

2. Fill out the REPAIR/SERVICE ORDER enclosed in this manual and ship it with the malfunctioning equipment to the Dranetz Customer Service Department.

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SECTION II
INSTALLATION AND OPERATION

2.1 INSTALLATION

2.1.1 Selection of Nominal Operation Frequency

Factory set switches in the 6003 optimize the measurements for a nominal frequency of either 50 or 60 Hz. Figure 2-1 locates these switches on the Analog board of the module. Dots on switches on the figure indicate which side of the switch is to be depressed for 60 Hz. For 50 Hz operation, simply reverse all switch positions.

2.1.2 Installation of 6003 in Mainframe

CAUTION: Be sure that all power is removed from the 626 and modules.

a. With the rear panel markings reading correctly, carefully slide the module into the desired slot, with the Digital board within the card-guide tracks until it is firmly seated.

b. Tighten the top and bottom captive screws to secure the module into the mainframe.

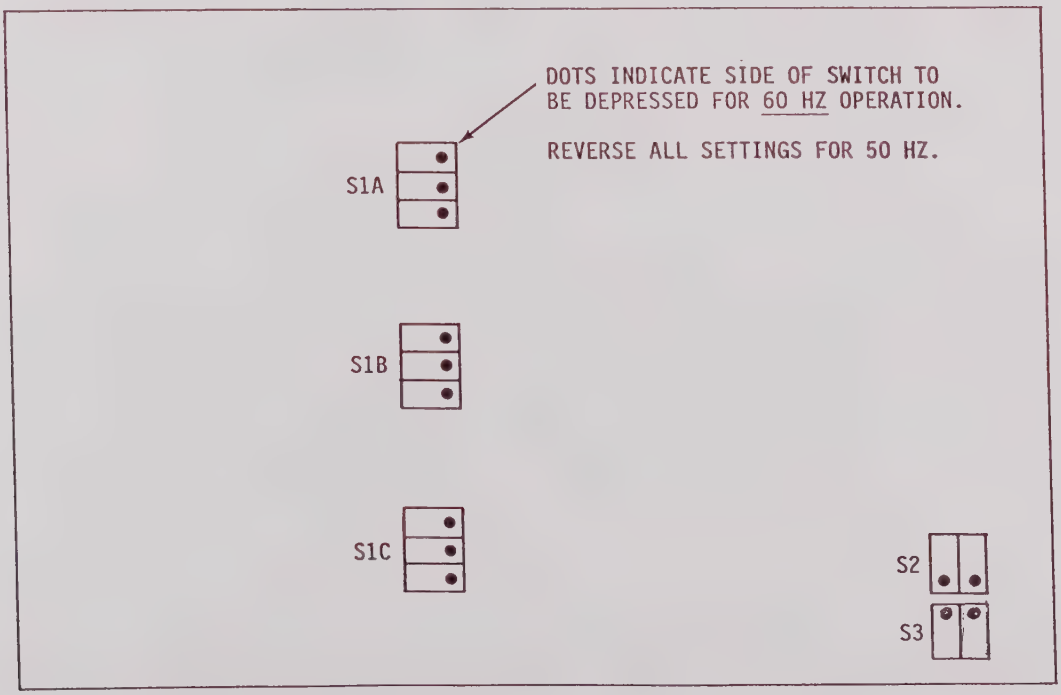

Figure 2-1. Analog Board Switch Locations

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2.1.3 LOAD RATINGS

The Series 626 standard mainframe has an upper limit of the combined total rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating	Plug-in	Load Rating
626-PA-6001	2 Units	626-PA-60012A	3 Units
626-PA-6001 with Extra Option Board	3 Units	626-PA-6013	2 Units
626-PA-6002	2 Units	626-PA-6014	1 Unit
626-PA-6003	4 Units	626-PA-6015	4 Units
626-PA-6005	2 Units	626-PA-6018	4 Units
626-PA-6006	2 Units	626-PA-6020	4 Units
626-PA-6007	1 Unit	626-PA-6024A	4 Units
626-PA-6008	2 Units	626-PA-6024B	4 Units
626-PA-6009	4 Units	626-PA-6025	4 Units
626-PA-6011	1 Unit	626-PA-6030	6 Units
626-PA-6012	2 Units	626-PA-6037	1 Unit
		626-PA-6038	1 Unit
		626-PA-6040	6 Units

NOTE

When selecting modules for installation in any mainframe, verify that the sum of the load ratings of the installed modules DOES NOT exceed 20.

2.2 CONNECTING POWER SOURCE TO MODULE

2.2.1 Connection Procedure

The 6003 is equipped with either three rear panel AC connectors, or a barrier block. Inputs include phase A, B, and C. Connectors must be wired in accordance with the rear panel connector markings (AC high, AC low, and earth ground from top to bottom).

a. Turn the 626 off by inserting the key in FUNCTION key switch on front panel of mainframe and setting the switch to the OFF position.

b. Turn off power source that is to be monitored by the module.

c. Make all connections to the 6003 module first. If the 6003 has been supplied with connectors, merely insert the mating connector, supplied with the unit, until a "click" is heard.

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If the 6003 has been supplied with a barrier block, make all connections to the barrier block first, then be sure to replace the barrier block cover. DO NOT PROCEED UNTIL PARAGRAPH C IS COMPLETE.

d. Make the desired connections to the power source to be monitored.

e. Power up the 626 by turning the FUNCTION key switch to the OPERATE position.

f. Turn on power source to be monitored.

WARNING: Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) and/or any other requirements applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

CAUTION: To avoid damaging the equipment, do not apply AC voltages in excess of 600V RMS to any AC phase input (A,B, or C) of the 6003.

2.2.2 Circuit Applications

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

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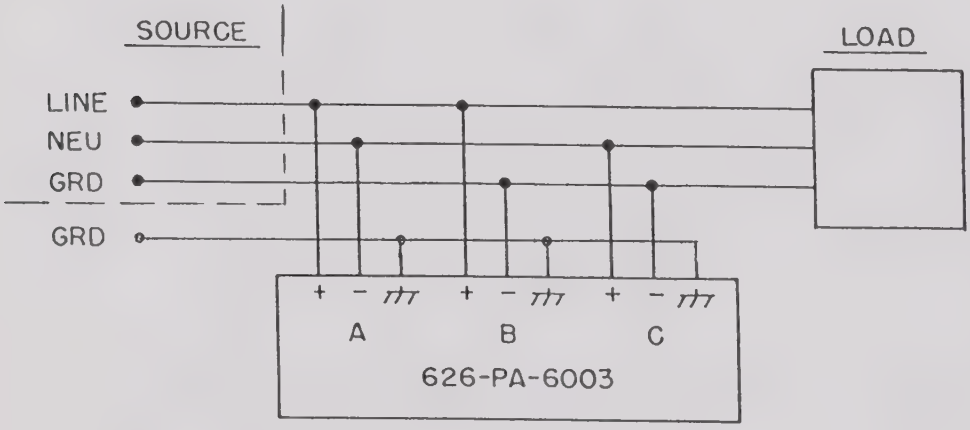
The 3-phase AC monitor for 45-65 Hz may be used for 3Ø Wye, 3Ø Delta, or for up to three separate AC signals. It may be used by itself to do Normal Mode/Common Mode analysis on 1 phase lines, or in combination with a 626-PA-6006 to do Normal Mode/Common Mode analysis on a 3 phase wye line.



1 Phase Normal Mode/Common Mode

Readings:

Channel A: LINE-Neutral
Channel B: LINE-Ground
Channel C: Neutral-Ground

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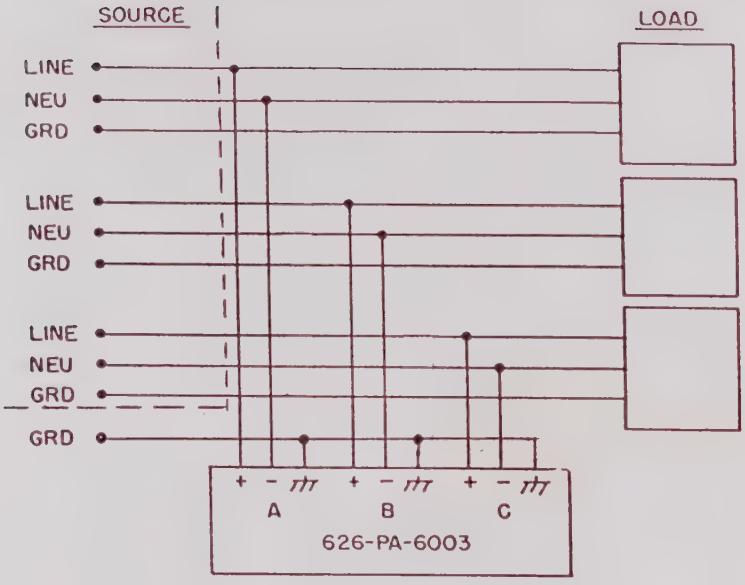

3 Separate AC Lines

Notes

1. All Channels are monitored independently.
2. All line frequencies must be the same.
3. All 3 channels will have same program set-up.

3 Phase Delta

Notes

1. Delta may be grounded or ungrounded
2. Set 626-PA-6003 to monitor line-to-line voltage
   e.g.: For 240 volt delta, set High and Low Limits to either side of 240 VAC.

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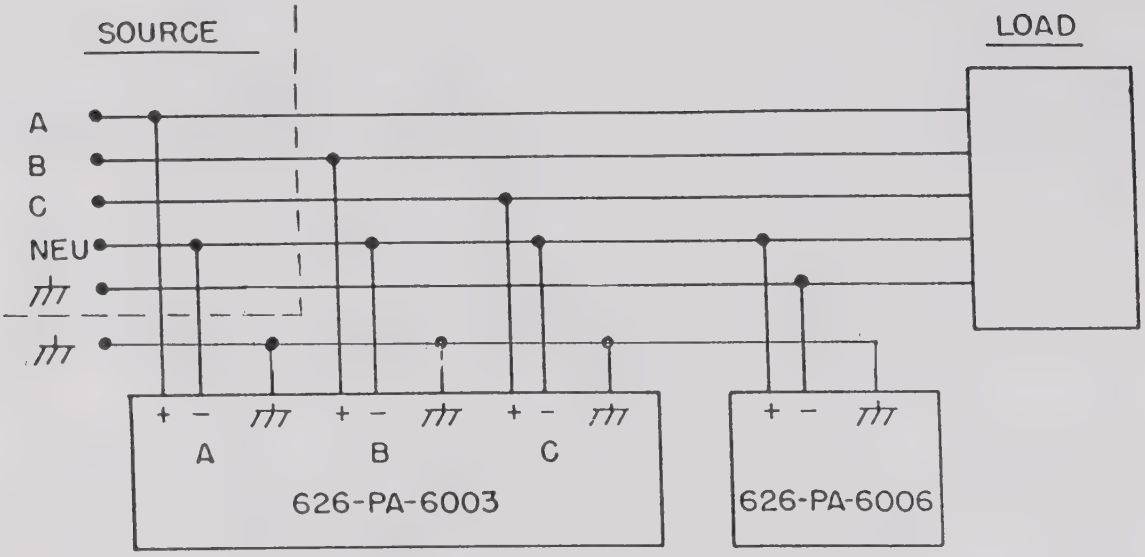

3 Phase Wye

Notes

1. 626-PA-6006 is added to perform Neutral-Ground (COMMON mode) monitoring.

2. Wye distribution is normally monitored Line-to-Neutral, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 120.

3. To monitor wye system line-to-line, set High and Low Limits to either side of higher stated voltage, and connect to 626-PA-6003 as though lines A, B, and C were from a delta, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 208.

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2.2.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious Impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of Impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade Potential Transformers for monitoring Impulses on high voltage power lines is not recommended. The limited frequency response of most Potential Transformers may result in substantial variation of Impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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2.3 OPERATING THE 6003

2.3.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6003 operation are described in Table 2-1. Figure 2-2 shows the Series 626 controls used by the 6003 module. For a description of controls common to overall Model 626 operation, refer to Volume 1 of the Mainframe manual.

2.3.2 Programming Procedure

Assume it is desired to program a high limit of 125V, a low limit of 105V, voltage sensitivity of 2 volts, frequency sensitivity of 0.2 Hz and an impulse sensitivity of 50V. Voltage and frequency sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 25 volts, a disturbance is recorded when impulse amplitude rises above 25 volts.

NOTE

1. It is recommended that the HI and LO limits be set to at least 3V (respectively) from the nominal voltage being measured. For example, if monitoring 120V, the high and low limits should be 117V (or less) and 123V (or more), respectively.

2. It is also recommended that the sensitivity be set to at least 2% of the nominal input voltage.

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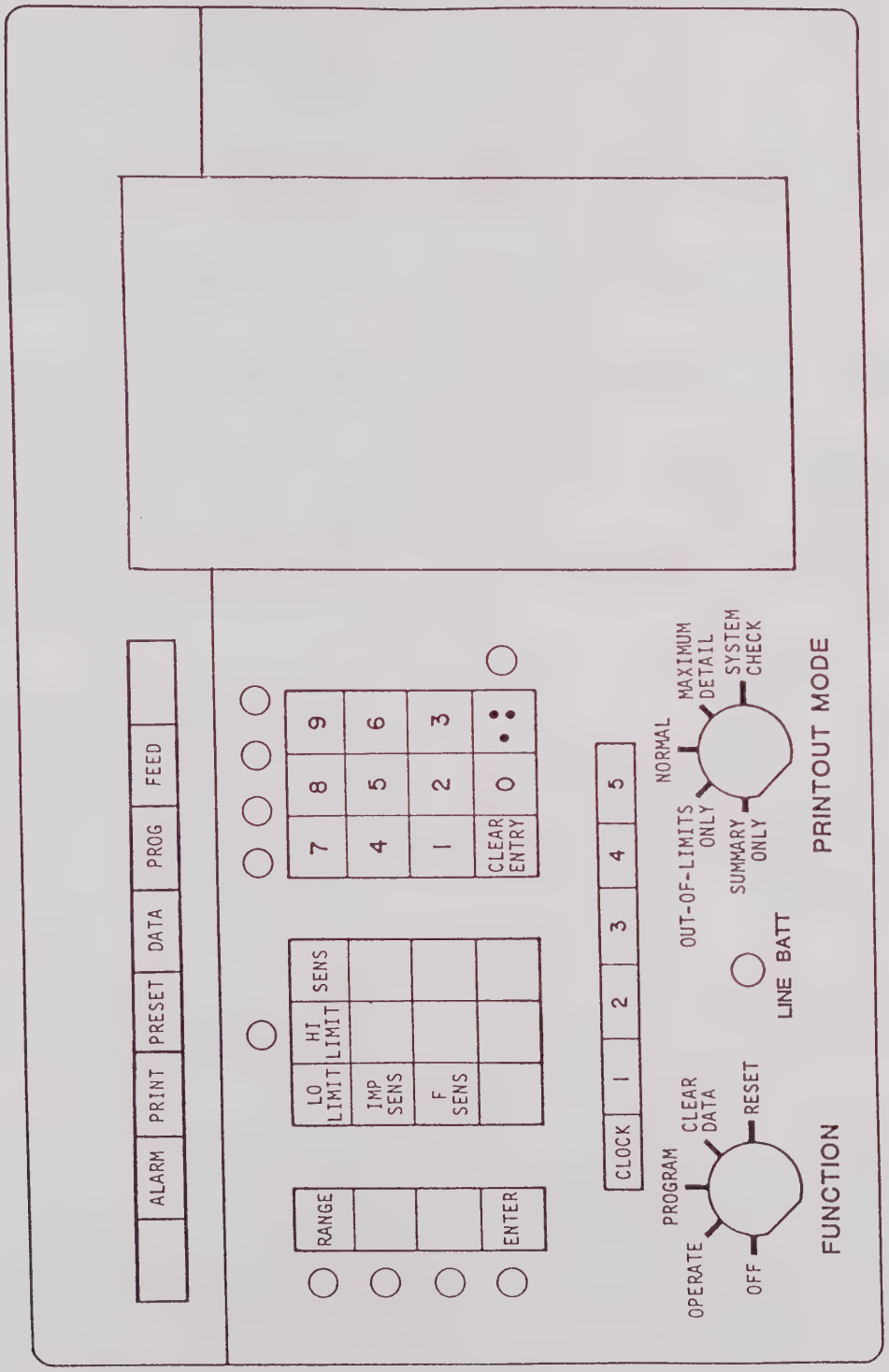

Figure 2-2. Series 626 Controls Used by the 6003 Plug-In

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Table 2-1. 6003 Operating Controls

Item	Function
LO LIMIT pushbutton	When depressed, enables numeric keyboard to program low limit voltage.
HI LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
F SENS pushbutton	When depressed, enables numeric keyboard to program frequency sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6003 memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel.

For the example cited, program the 6003 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that a cueing indicator above the center bank of pushbuttons lights. This indicates that a function may be programmed.

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d. Depress the HI LIMIT pushbutton. Program the high limit value (125), using the keyboard.

e. When the ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout and the ENTER indicator will go out.

f. Repeat steps c, d and e for the low limit voltage (105V) using the LO LIMIT pushbutton.

g. Repeat steps c, d and e for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 02.

h. Repeat steps c, d and e for the frequency sensitivity (0.2 Hz), using the F SENS pushbutton and programming the value as 0.2.

i. Repeat steps c, d and e for the impulse sensitivity (0050 volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

626

IMPULSE SENS	0050V
FREQ SENS	00.2 HZ
VOLTAGE SENS	002 V
V LOW LIMIT	105 V
V HIGH LIMIT	125 V
626-PA-6003	
CH 4	

626A,G,R,ARA

CH 4	
626-PA-6003	
V HIGH LIMIT	125V
V LOW LIMIT	105V
VOLTAGE SENS	002 V
FREQ SENS	00.2 HZ
IMPULSE SENS	0050V

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits.

j. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

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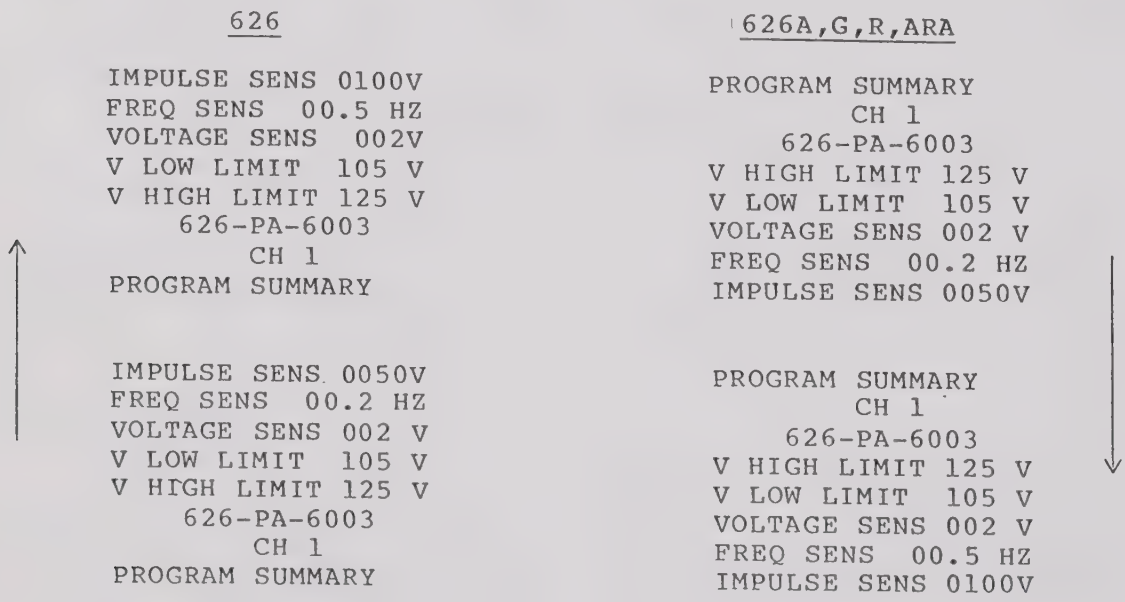
2.4 SELECTING THE FACTORY PRESET PROGRAM

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below. The printout group generated first is the operator program; the second is the factory program printed after the PRESET button is pressed.



2.5 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6003, it is recorded and displayed in characteristic manner.

2.5.1 Overvoltage

An overvoltage condition exists when the monitored power line voltage exceeds the user-specified upper limit for more than 2.55 seconds. An overvoltage condition is indicated by a printout such as the following:

4B HI 09:46:07.11

where 4 is the channel number, B is the phase and time is given in hours, minutes and seconds (to .01 sec resolution).

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When the line voltage recovers to normal, a printout such as the following occurs:

626	626A,G,R,ARA
4B NOR Ø9:46:15.2Ø	148.6 V MAX
148.6 V MAX	4B NOR Ø9:46:15.2Ø

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

2.5.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. An undervoltage condition is indicated by a printout such as the following:

```
4C  LO   Ø9:46:15.2Ø
```

When the line voltage returns to normal level, a message such as the following is printed:

626	626A,G,R,ARA
4C NOR Ø9:46:18.45	36.4 V MIN
36.4 V MIN	4C NOR Ø9:46:18.45

indicating when normal voltlage was restored and the value of the lowest voltage reached during the undervoltage interval.

2.5.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected integer voltage between one and 15 volts for a 115-volt line. The following example shows several voltage change printouts. The first shows that Phase A voltage in channel 3 decreased to 1Ø9.2V at time shown. The second printout shows that phase C voltage increased to 115.4V at time shown.

626	626A,G,R,ARA
2C INC Ø1:Ø2:34.56	115.4 V
115.4 V	2C INC Ø1:Ø2:34.56
3A DEC Ø1:Ø2:34.56	1Ø9.2 V
1Ø9.2 V	3A DEC Ø1:Ø2:34.56

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2.5.4 Voltage Surge

A Voltage Surge is defined as a line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
4B   HI   09:45:33.15
```

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

626

```
↑ 4B  NOR   09:45:33.38
      128.2  V  MAX
      SURGE 0.23 SEC
```

626A,G,R,ARA

```
      SURGE 0.23 SEC
      128.2  V  MAX
4B    NOR   09:45:33.38   ↓
```

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

2.5.5 Voltage Sag

A voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

NOTE

Voltage inputs less than 25V RMS will be printed out as 0.0V on the 6003.

2.5.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

626

```
↑ 2A IMP 10:12:13.45
  +0139 V, 0010 US
```

626A,G,R,ARA

```
+0139 V, 0010 US
2A IMP 10:12:13.45   ↓
```

This printout indicates that an impulse which deviated from normal line voltage by +139 volts peak and whose duration was 10 microseconds was detected on phase A of Channel 2 at the time shown. The impulse magnitude is measured with respect to the instantaneous point on the power frequency sinewave at which it occurs. Impulse polarity is referenced to "+" and "-" markings on rear panel.

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2.5.7 Frequency Change

A frequency change printout is triggered when the line frequency changes more than a preselected amount from the last printed value. The frequency change sensitivity is a user-selected value between Ø.2 Hz and 3.Ø HZ in Ø.1 HZ increments. The following example shows several frequency change printouts.

626	626A,G,R,ARA
3 FRQ 1Ø:16:27.Ø2	Ø6Ø.5 HZ
Ø6Ø.5 HZ	3 FRQ 1Ø:16:27.Ø2
3 FRQ 1Ø:16:24.32	Ø6Ø.Ø HZ
Ø6Ø.Ø HZ	3 FRQ 1Ø:16:24.32
3 FRQ 1Ø:16:17.Ø2	Ø59.5. HZ
Ø59.5 HZ	3 FRQ 1Ø:16:17.Ø2

2.6 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise. The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in phase A of Channel 1 and that the limits for Channel 1 were programmed as follows:

V LOW LIMIT	1Ø5 Vrms
V HIGH LIMIT	125 Vrms
V SENSITIVITY	2 Vrms

The example printouts are referenced to figures 2-3 and 2-4 which illustrate overvoltage and voltage sag disturbances, respectively.

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

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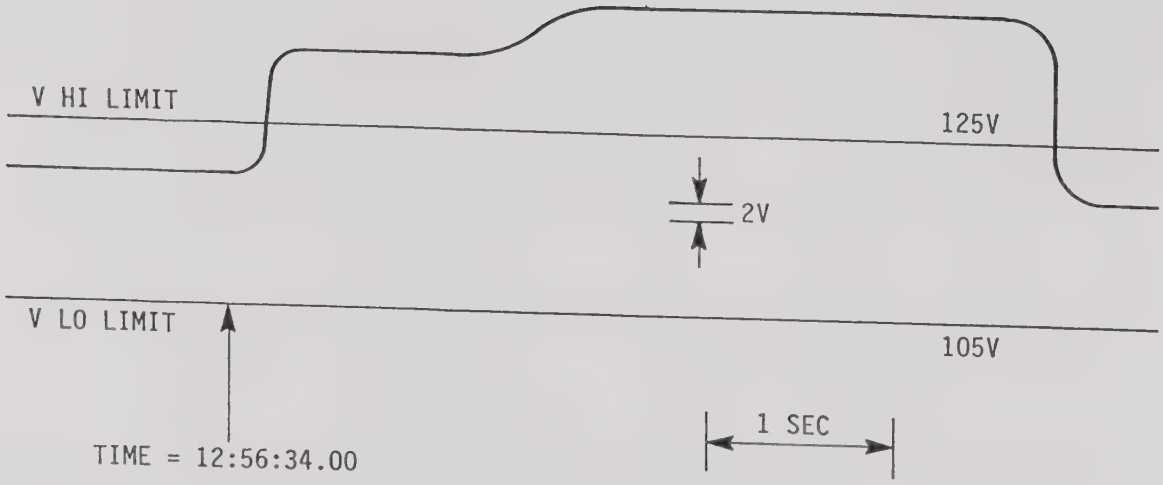

Figure 2-3. Overvoltage Disturbance (6003)

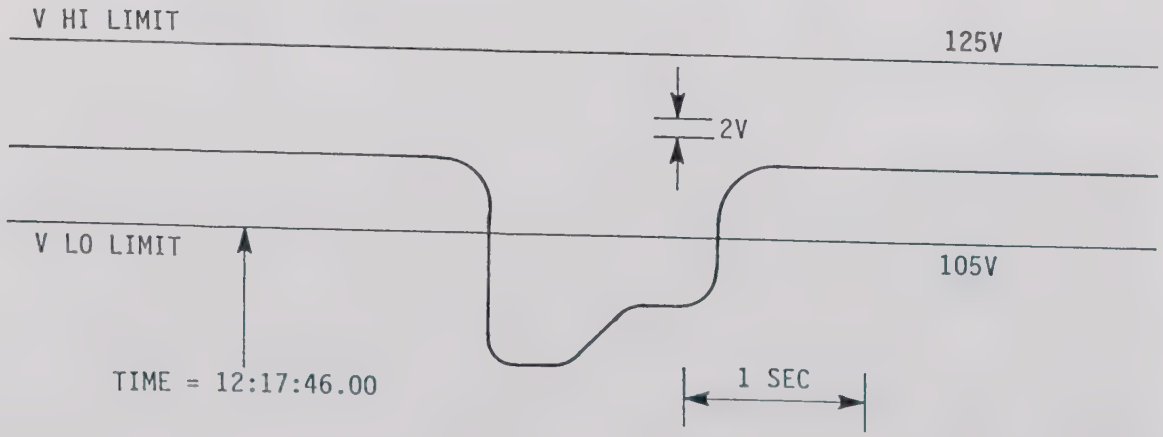

Figure 2-4. Voltage Sag Disturbance (6003)

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The first printout group generated below illustrates overvoltage (fig. 2-3) in the NORMAL mode. The second (3-line) group illustrates overvoltage in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:56:38.51
    139.1  V  MAX

1A  HI    12:56:34.21
```

```
1A  NOR   12:56:38.51
    139.1  V  Max

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3 V

1A  INC   12:56:35.62
    135.3 V

1A  INC   12:56:35.40
    133.3 V

1A  INC   12:56:34.22
    131.3 V

1A  INC   12:56:34.21
    129.2 V

1A  HI    12:56:34.21
```

626A,G,R,ARA

```
1A  HI    12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V   MAX
1A  NOR   12:56:38.51
```

```
1A  HI    12:56:34.21

    139.1  V   MAX
1A  NOR   12:56:38.51
```

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The following is a printout of overvoltage (fig. 2-3) in the MAXIMUM DETAIL mode.

626

```
1A  DEC   12:56:38.61
    119.8  V

1A  DEC   12:56:38.53
    121.8  V

1A  DEC   12:56:38.51
    124.0  V

1A  NORM  12::56:38.51
    139.1  V  MAX

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3

1A  INC   12:56:35.62
    135.3  V

1A  INC   12:56:35.40
    133.3  V

1A  INC   12:56:34.22
    131.3  V

1A  INC   12:56:34.21
    129.2  V

1A  HIGH  12:56:34.21

1A  INC   12:56:34.20
    121.1  V

1A  INC   12:50:12.34
    119.0  V
```

626A

```
    119.0  V
1A  INC   12:50:12.34

    121.1  V
1A  INC   12:56:34.20

1A  HIGH  12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V
1A  NORM  12:56:38.51

    124.0  V
1A  DEC   12:56:38.51

    121.8  V
1A  DEC   12:56:38.53

    119.8  V
1A  DEC   12:56:38.61
```


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The first group of generated printouts below illustrates voltage sag (fig. 2-4) in the NORMAL mode. The second group illustrates voltage sag in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:17:48.61
    Ø9Ø.1  V  MIN
    SAG  1.25 SEC

1A  LOW   12:17:47.36


1A  NORM  12:17:48.61
    Ø9Ø.1   V  MIN
    SAG   1.25 SEC

1A  INC   12:17:48.6Ø
    1Ø3.1  V

1A  INC  12:17:48.55
    Ø98.Ø  V

1A  INC   12:17:48.Ø5
    Ø96.Ø  V

1A  INC   12:17:47.96
    Ø94.Ø  V

1A  DEC   12:17:47.39
    Ø91.9  V

1A  DEC   12:17:47.37
    Ø94.1  V

1A  DEC   12:17:47.36
    1Ø1.3  V

1A  LOW   12:17:47.36
```

626A,G,R,ARA

```
1A  LOW    12:17:47.36

    1Ø1.3   V
1A  DEC    12:17:47.36

    Ø94.1   V
1A  DEC    12:17:47.37

    Ø91.9   V
1A  DEC    12:17:47.39

    Ø94.Ø   V
1A  INC    12:17:47.96

    Ø96.Ø   V
1A  INC    12:17:48.Ø5

    Ø98.Ø   V
1A  INC    12:17:48.55

    1Ø3.1   V
1A  INC    12:17:48.6Ø

    SAG   1.25 SEC
    Ø9Ø.1   V  MIN
1A  NORM   12:17:48.61


1A   LOW   12:17:47.36

     SAG  1.25 SEC
     Ø9Ø.1  V   MIN
1A   NOR   12:17:48.61
```

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The following printout illustrates voltage sag (fig. 2-4) in the MAXIMUM DETAIL mode.

626

```
1A  DEC    12:27:48.86
    112.1  V

1A  INC    12:17:48.69
    110.0  V

1A  INC    12:17:48.62
    108.1  V

1A  INC    12:17:48.61
    105.9

1A  NORM   12:17:48.61
    090.1    V  MIN
    SAG    1.25  SEC

1A  INC    12:17:48.60
    103.1  V

1   INC    12:17:48.55
    098.0  V

1A  INC    12:17:48.05
    096.0  V

1A  INC    12:17:47.96
    094.0  V

1A  DEC    12:17:47.39
    091.9  V

1A  DEC    12:17:47.37
    094.1  V

1A  DEC    12:17:47.36
    101.3  V

1A  LOW    12:17:47.36

1A  DEC    12:17:47.35
    110.8  V

1A  INC    12:16:32.15
    113.0  V
```

626A,G,R,ARA

```
    113.0  V
1A  INC    12:16:32.15

    110.8  V
1A  DEC    12:17:47.35

1A  LOW    12:17:47.36

    101.3  V
1A  DEC    12:17:47.36

    094.1  V
1A  DEC    12:17:47.37

    091.9  V
1A  DEC    12:17:47.39

    094.0  V
1   INC    12:17:47.96

    096.0  V
1A  INC    12:17:48.05

    098.0  V
1A  INC    12:17:48.55

    103.1  V
1A  INC    12:17:48.60

    SAG    1.25  SEC
    090.1    V  MIN
1A  NORM   12:17:48.61

    105.9  V
1A  INC    12:17:48.61

    108.1  V
1A  INC    12:17:48.62

    110.0  V
1   INC    12:17:48.69

    112.1  V
1   INC    12:27:48.86
```


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SECTION III
OPERATIONAL TEST

3.1 GENERAL

This section provides information for performing an operational test to verify that the 6003 plug-in is operating properly.

3.2 SYSTEM CHECK

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6003. Any inputs connected at this time will be automatically disconnected during the system check period. Successful measurement of these signals verifies that the module is fully operational. Expected system check measurement results and allowable tolerances are listed below.

AC Voltage	196.0-204.0 Volts
Impulse Peak	2700-3300 Volts
Impulse Duration	360-440 uSec
Frequency	59.8-60.2 Hz

3.3 SAMPLE SYSTEM CHECK PRINTOUT

A typical system check printout obtained from a 6006 plug-in is illustrated below.

626

```
******************


IMP- 3008V, 0396US
AC VOLTS    199.4V
       PH C
IMP- 3064V, 0395US
AC VOLTS    199.5V
       PH B
IMP- 3103V, 0397US
AC VOLTS    199.8V
       PH A
FRQ    060.0 HZ
   626-PA-6003
       CH 4

TIME = 00:00:12.10
***SYSTEM CHECK***
```

626A,G,R,ARA

```
***SYSTEM CHECK***
TIME = 00:00:12.10

       CH 4
   626-PA-6003
FRQ    060.0 HZ
       PH A
AC VOLTS    199.8V
IMP- 3103V, 0397US
       PH B
AC VOLTS    199.5V
IMP- 3064V, 0395US
       PH C
AC VOLTS    199.4V
IMP- 3008V, 0396US


******************
```

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1001402

WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110235U-1

VOLUME 1

OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

NOTE: Refer to Volume 2 (Service Manual) of TM-110235U for maintenance data

1 May 1984
(Rev. 1 July 1984)
(Rev. 1 Sept. 1985)
(Rev. 1 May 1986)
(Rev. 15 May 1987)
(Rev. 1 Sept. 1989)
(Rev.B)

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IMPORTANT! CALIBRATION INTERVAL

The recommended calibration interval for this unit is once every 12 MONTHS.

We recommend that you return the unit to the factory for calibration. If you decide to do so, first contact the Dranetz Customer Service Department to obtain an authorization number.

Telephone Number:	(908) 287-3680
Telex Number:	499-7808
TWX Number:	(908) 997-9553
FAX Number:	(908) 248-9240
Cable:	DRANETZ

Then fill out the Repair/Service Order form enclosed in this manual and ship it along with the unit to the Dranetz Customer Service Department. (If this form is missing, ask the Dranetz Customer Service Department for a replacement.)

STATEMENT OF WARRANTY

ALL PRODUCTS OF DRANETZ TECHNOLOGIES, INC. ARE WARRANTED TO THE ORIGINAL PURCHASER AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. DRANETZ WILL REPAIR OR REPLACE, AT ITS OPTION, ALL DEFECTIVE EQUIPMENT RETURNED, FREIGHT PREPAID, DURING THE WARRANTY PERIOD, WITHOUT CHARGE FOR REPAIR, PROVIDED THERE IS NO EVIDENCE THAT THE EQUIPMENT HAS BEEN MISHANDLED OR ABUSED. THIS WARRANTY SHALL NOT APPLY TO ANY DEFECTS RESULTING FROM IMPROPER OR INADEQUATE MAINTENANCE, BUYER-SUPPLIED HARDWARE/SOFTWARE OR INTERFACING, UNAUTHORIZED MODIFICATION OR MISUSE OF THE EQUIPMENT, OPERATION OUTSIDE OF THE ENVIRONMENTAL SPECIFICATIONS FOR THE PRODUCT, OR IMPROPER SITE PREPARATION OR MAINTENANCE.

The information in this manual has been reviewed and is believed to be entirely reliable. No responsibility, however, is assumed for any inaccuracies. The material in this manual is for information purposes only, and is subject to change without notice.

VOLUME 1
OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

SECTION 1
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual, consists of three sections: I) GENERAL INFORMATION, II) INSTALLATION AND OPERATION, and III) OPERATIONAL CHECK. Volume 2, the Service manual, contains the maintenance instructions.

1.2 INTRODUCTION

This manual provides operating instructions for the 626-PA-6003 Plug-in, hereinafter referred to as the 6003, used in the Series 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in Volume 1 of the Mainframe manual.

1.3 PURPOSE

The 6003 monitors disturbances on 3-phase AC power lines with either 50 or 60 Hz nominal frequency. Each phase is monitored on a single voltage range of 0 to 600 V RMS. With thresholds programmed by the user, the 6003 monitors both short and long term power line disturbances. With this plug-in, the unit stores, analyzes, classifies and prints out quantative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The plug-in monitors any 3-phase power line whose RMS values range from a low value of 0 volts to as high as 600 volts. Three types of disturbances are monitored by the 6003: power line frequency, power frequency transients and waveform disturbances. Power frequency transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses", include all conditions that cause the power line waveform to deviate from an ideal waveform. The 6003 measures the peak amplitude of impulses, their polarity and duration. The threshold value of each type of disturbance, as well as the line frequency, above which detection and printout occurs is operator programmable. (All threshold settings are common to all three line phases.) Except for an automatic summary printout at the end of day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of the day. This feature permits long term unattended operation.

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The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

NOTE: Frequency measurements are derived from phase A only. Therefore, if single-phase monitoring is desired, phase A should be used.

1.4 APPLICATIONS

When installed in the 626 mainframe, the 6003 provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the instrument permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

b. To perform pre-installation site surveys. The 6003 can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable instrument, particularly well suited for field use, is ideal for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the instrument provides a clear record of the quality of power supplied during unattended periods.

1.5 EQUIPMENT CHARACTERISTICS

The 6003 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in one of four slots of the Series 626 Universal Disturbance Analyzer. Technical specifications of the 6003 are presented in Table 1-1.

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Table 1-1. 626-PA-6003 Technical Specifications

Input	2 wire differential Z_{in} = 40 Megohms plus 40 pf (each side to ground)
Input Voltage Range	50-600V RMS
Lower Limit of User-Set Voltage (V_{LOW})	50V to 599V
Upper Limit of User-Set voltage (V_{HIGH})	600V to 51V
Voltage Change Sensitivity (V_{SENS}) (1V Increments)	2 to 60V
Line Voltage Measurement Resolution	0.2V
Line Voltage Measurement Accuracy	±1% of reading, ±0.2% of full scale (75V to 600V)
Line Frequency	
Range	45-65 Hz
Resolution	±0.1 Hz
Accuracy	±0.1 Hz
Impulse Range	50-4000V Pk (1-2000 uSec)
Impulse Peak Resolution	1V
Impulse Accuracy	±10% of reading ±1% F.S. (5 uSec-50 uSec.) (decreasing to ±6 dB from 1 uSec to 2 mSec) 100V-4000V
Impulse Duration Range	1 uSec to 2 mSec
Impulse Duration Resolution	1 uSec

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1.6 STANDARD ACCESSORIES

Model No.	Part No.	Quan.	Description
626PA6003-1 (Barrier, Block Connections)	TM110235U (Vol. 1)	1	Operating Manual
626PA6003-2 (Plug-type Connections)	TM110235U (Vol. 1)	1	Operating Manual
	110480-G1	3	A.C. Cables

1.7 OPTIONAL ACCESSORIES

Part No.	Quan.	Description
TM-110235U (Vol. 2)	1	Service (Maintenance Manual)

1.8 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Customer Service Department in order to obtain an Authorization Number.

   Telephone No: (908) 287-3680
   TWX: (908) 997-9553
   FAX: (908) 248-9240
   Telex: 499-7808
   Cable: DRANETZ

2. Fill out the REPAIR/SERVICE ORDER enclosed in this manual and ship it with the malfunctioning equipment to the Dranetz Customer Service Department.

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SECTION II
INSTALLATION AND OPERATION

2.1 INSTALLATION

2.1.1 Selection of Nominal Operation Frequency

Factory set switches in the 6003 optimize the measurements for a nominal frequency of either 50 or 60 Hz. Figure 2-1 locates these switches on the Analog board of the module. Dots on switches on the figure indicate which side of the switch is to be depressed for 60 Hz. For 50 Hz operation, simply reverse all switch positions.

2.1.2 Installation of 6003 in Mainframe

CAUTION: Be sure that all power is removed from the 626 and modules.

a. With the rear panel markings reading correctly, carefully slide the module into the desired slot, with the Digital board within the card-guide tracks until it is firmly seated.

b. Tighten the top and bottom captive screws to secure the module into the mainframe.

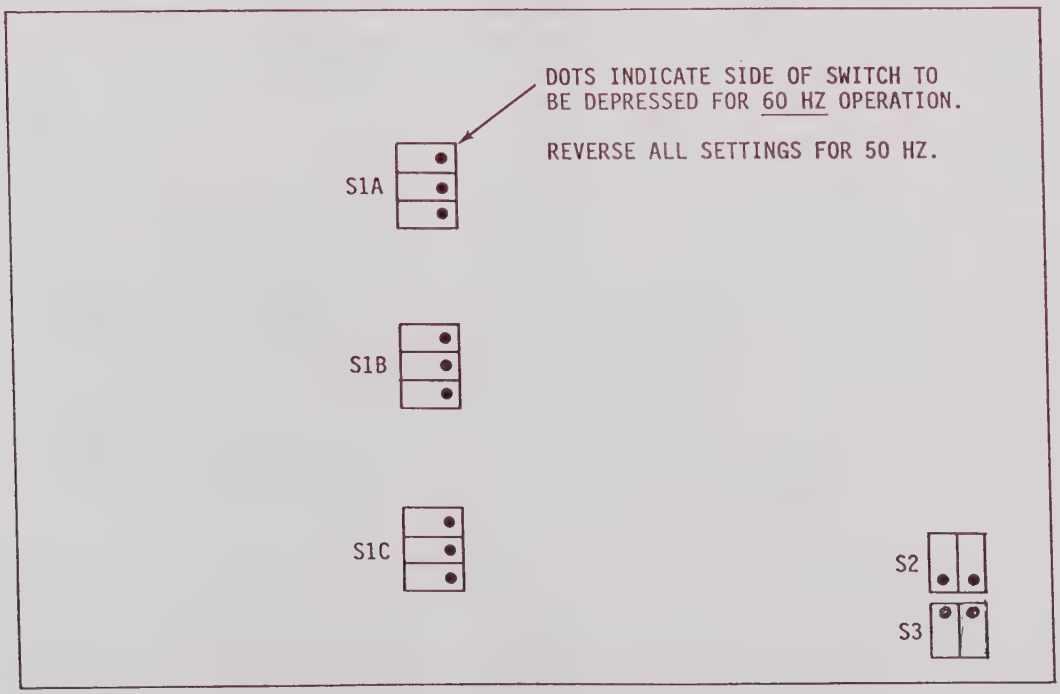

Figure 2-1. Analog Board Switch Locations

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2.1.3 LOAD RATINGS

The Series 626 standard mainframe has an upper limit of the combined total rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating	Plug-in	Load Rating
626-PA-6001	2 Units	626-PA-60012A	3 Units
626-PA-6001 with Extra Option Board	3 Units	626-PA-6013	2 Units
		626-PA-6014	1 Unit
626-PA-6002	2 Units	626-PA-6015	4 Units
626-PA-6003	4 Units	626-PA-6018	4 Units
626-PA-6005	2 Units	626-PA-6020	4 Units
626-PA-6006	2 Units	626-PA-6024A	4 Units
626-PA-6007	1 Unit	626-PA-6024B	4 Units
626-PA-6008	2 Units	626-PA-6025	4 Units
626-PA-6009	4 Units	626-PA-6030	6 Units
626-PA-6011	1 Unit	626-PA-6037	1 Unit
626-PA-6012	2 Units	626-PA-6038	1 Unit
		626-PA-6040	6 Units

NOTE

When selecting modules for installation in any mainframe, verify that the sum of the load ratings of the installed modules DOES NOT exceed 20.

2.2 CONNECTING POWER SOURCE TO MODULE

2.2.1 Connection Procedure

The 6003 is equipped with either three rear panel AC connectors, or a barrier block. Inputs include phase A, B, and C. Connectors must be wired in accordance with the rear panel connector markings (AC high, AC low, and earth ground from top to bottom).

a. Turn the 626 off by inserting the key in FUNCTION key switch on front panel of mainframe and setting the switch to the OFF position.

b. Turn off power source that is to be monitored by the module.

c. Make all connections to the 6003 module first. If the 6003 has been supplied with connectors, merely insert the mating connector, supplied with the unit, until a "click" is heard.

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If the 6003 has been supplied with a barrier block, make all connections to the barrier block first, then be sure to replace the barrier block cover. DO NOT PROCEED UNTIL PARAGRAPH C IS COMPLETE.

d. Make the desired connections to the power source to be monitored.

e. Power up the 626 by turning the FUNCTION key switch to the OPERATE position.

f. Turn on power source to be monitored.

WARNING: Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) and/or any other requirements applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

CAUTION: To avoid damaging the equipment, do not apply AC voltages in excess of 600V RMS to any AC phase input (A,B, or C) of the 6003.

2.2.2 Circuit Applications

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

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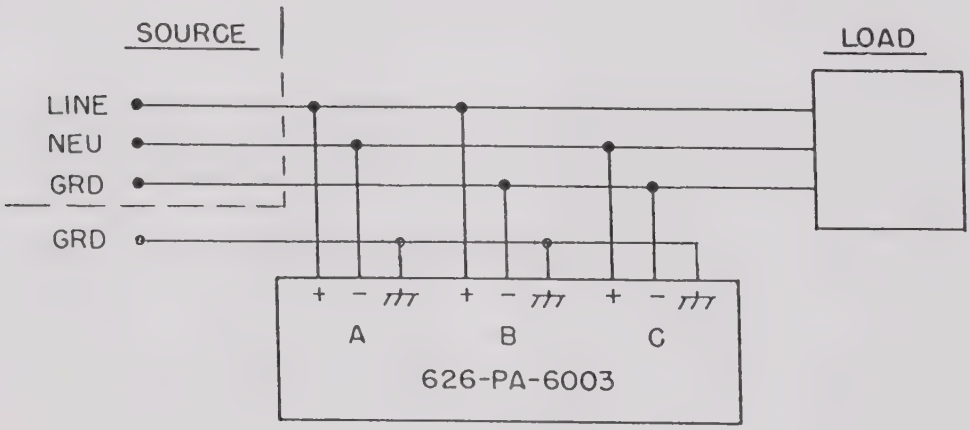
The 3-phase AC monitor for 45-65 Hz may be used for 3Ø Wye, 3Ø Delta, or for up to three separate AC signals. It may be used by itself to do Normal Mode/Common Mode analysis on 1 phase lines, or in combination with a 626-PA-6006 to do Normal Mode/Common Mode analysis on a 3 phase wye line.



1 Phase Normal Mode/Common Mode

Readings:

Channel A: LINE-Neutral
Channel B: LINE-Ground
Channel C: Neutral-Ground

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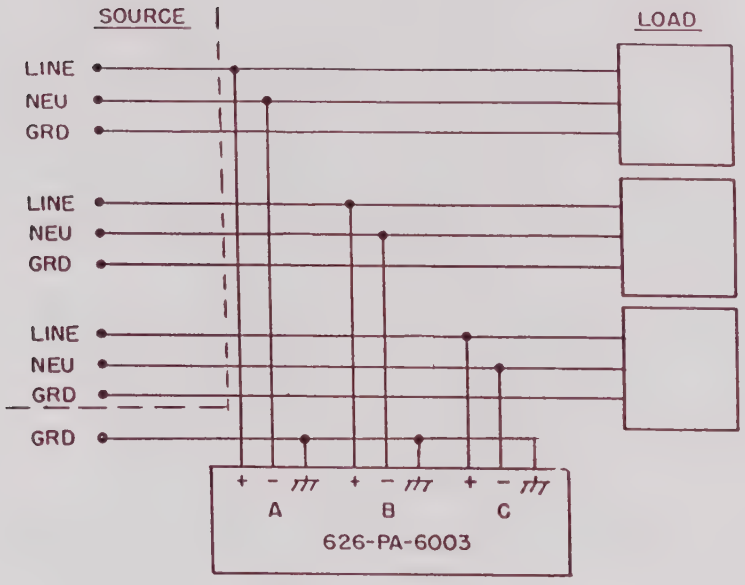
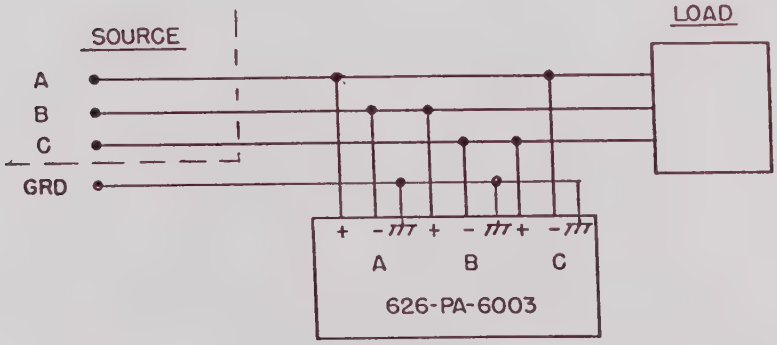


3 Separate AC Lines

Notes

1. All Channels are monitored independently.
2. All line frequencies must be the same.
3. All 3 channels will have same program set-up.



3 Phase Delta

Notes

1. Delta may be grounded or ungrounded
2. Set 626-PA-6003 to monitor line-to-line voltage
   e.g.: For 240 volt delta, set High and Low Limits
   to either side of 240 VAC.

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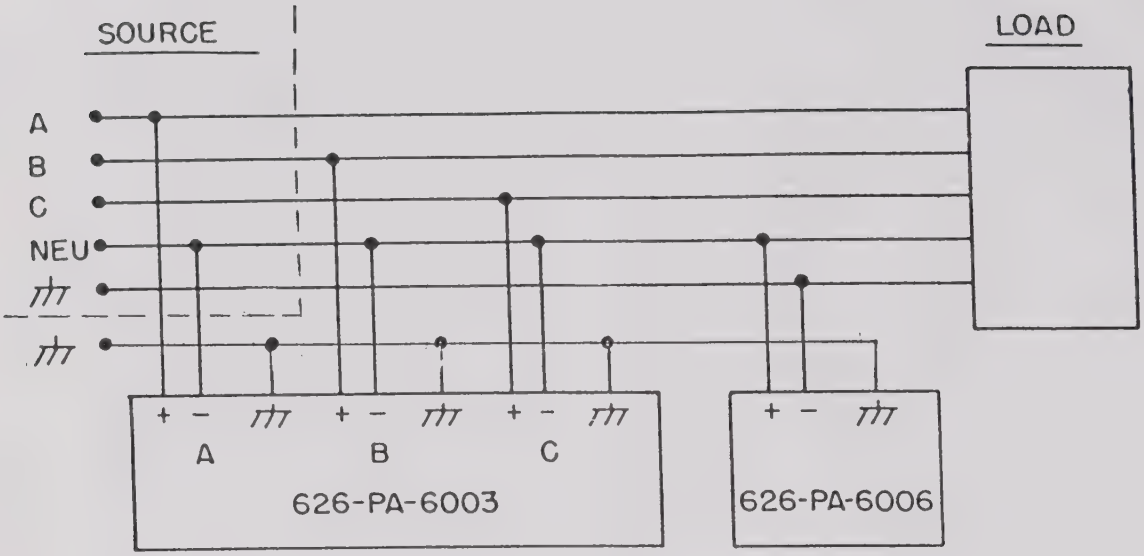

3 Phase Wye

Notes

1. 626-PA-6006 is added to perform Neutral-Ground (COMMON mode) monitoring.

2. Wye distribution is normally monitored Line-to-Neutral, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 120.

3. To monitor wye system line-to-line, set High and Low Limits to either side of higher stated voltage, and connect to 626-PA-6003 as though lines A, B, and C were from a delta, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 208.

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2.2.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious Impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of Impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade Potential Transformers for monitoring Impulses on high voltage power lines is not recommended. The limited frequency response of most Potential Transformers may result in substantial variation of Impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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2.3 OPERATING THE 6003

2.3.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6003 operation are described in Table 2-1. Figure 2-2 shows the Series 626 controls used by the 6003 module. For a description of controls common to overall Model 626 operation, refer to Volume 1 of the Mainframe manual.

2.3.2 Programming Procedure

Assume it is desired to program a high limit of 125V, a low limit of 105V, voltage sensitivity of 2 volts, frequency sensitivity of 0.2 Hz and an impulse sensitivity of 50V. Voltage and frequency sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 25 volts, a disturbance is recorded when impulse amplitude rises above 25 volts.

NOTE

1. It is recommended that the HI and LO limits be set to at least 3V (respectively) from the nominal voltage being measured. For example, if monitoring 120V, the high and low limits should be 117V (or less) and 123V (or more), respectively.

2. It is also recommended that the sensitivity be set to at least 2% of the nominal input voltage.

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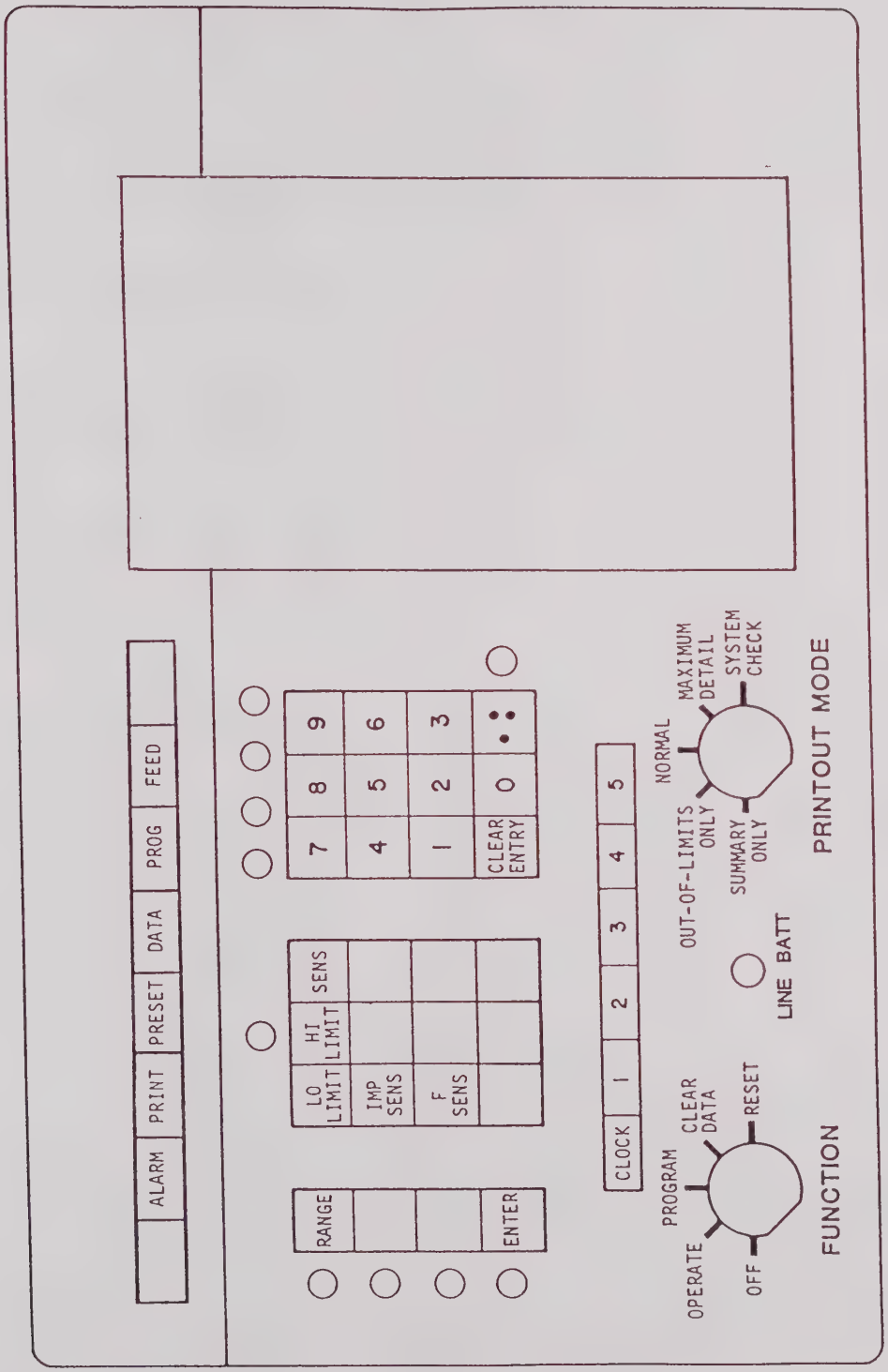

Figure 2-2. Series 626 Controls Used by the 6003 Plug-In

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Table 2-1. 6003 Operating Controls

Item	Function
LO LIMIT pushbutton	When depressed, enables numeric keyboard to program low limit voltage.
HI LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
F SENS pushbutton	When depressed, enables numeric keyboard to program frequency sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6003 memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel.

For the example cited, program the 6003 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that a cueing indicator above the center bank of pushbuttons lights. This indicates that a function may be programmed.

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d. Depress the HI LIMIT pushbutton. Program the high limit value (125), using the keyboard.

e. When the ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout and the ENTER indicator will go out.

f. Repeat steps c, d and e for the low limit voltage (105V) using the LO LIMIT pushbutton.

g. Repeat steps c, d and e for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 02.

h. Repeat steps c, d and e for the frequency sensitivity (0.2 Hz), using the F SENS pushbutton and programming the value as 0.2.

i. Repeat steps c, d and e for the impulse sensitivity (0050 volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

626

```
IMPULSE SENS      0050V
FREQ SENS       00.2 HZ
VOLTAGE SENS      002 V
V LOW LIMIT       105 V
V HIGH LIMIT      125 V
    626-PA-6003
        CH 4
```

626A,G,R,ARA

```
        CH 4
   626-PA-6003
V HIGH LIMIT      125V
V LOW LIMIT       105V
VOLTAGE SENS      002 V
FREQ SENS       00.2 HZ
IMPULSE SENS      0050V
```

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits.

j. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

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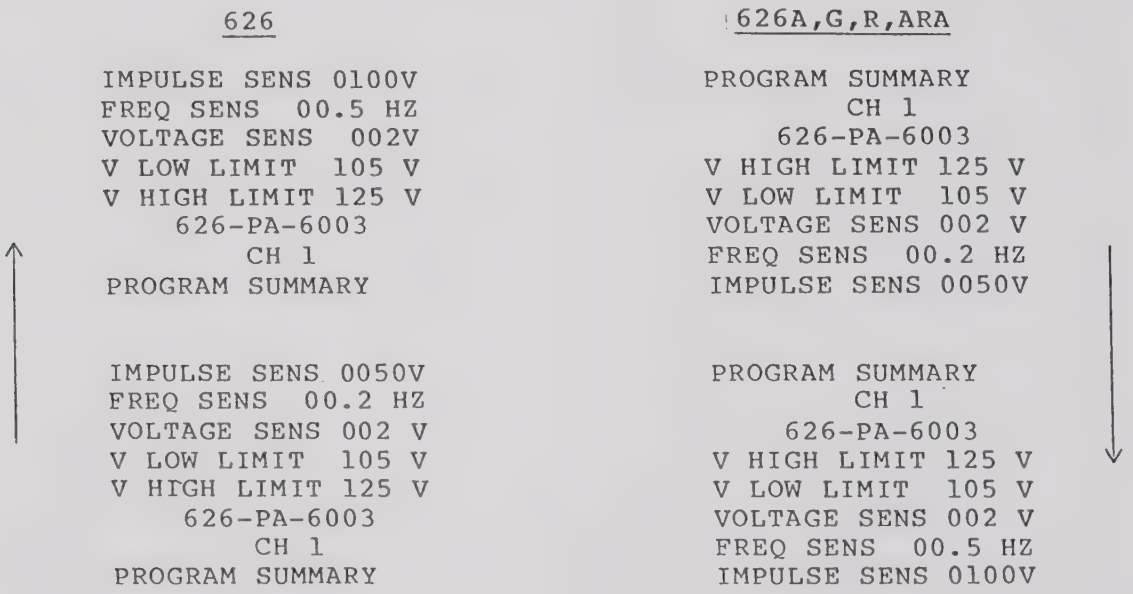
2.4 SELECTING THE FACTORY PRESET PROGRAM

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below. The printout group generated first is the operator program; the second is the factory program printed after the PRESET button is pressed.



2.5 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6003, it is recorded and displayed in characteristic manner.

2.5.1 Overvoltage

An overvoltage condition exists when the monitored power line voltage exceeds the user-specified upper limit for more than 2.55 seconds. An overvoltage condition is indicated by a printout such as the following:

4B HI 09:46:07.11

where 4 is the channel number, B is the phase and time is given in hours, minutes and seconds (to .01 sec resolution).

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When the line voltage recovers to normal, a printout such as the following occurs:

626	626A,G,R,ARA
4B NOR Ø9:46:15.2Ø 148.6 V MAX	148.6 V MAX 4B NOR Ø9:46:15.2Ø

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

2.5.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. An undervoltage condition is indicated by a printout such as the following:

```
4C  LO   Ø9:46:15.2Ø
```

When the line voltage returns to normal level, a message such as the following is printed:

626	626A,G,R,ARA
4C NOR Ø9:46:18.45 36.4 V MIN	36.4 V MIN 4C NOR Ø9:46:18.45

indicating when normal voltlage was restored and the value of the lowest voltage reached during the undervoltage interval.

2.5.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected integer voltage between one and 15 volts for a 115-volt line. The following example shows several voltage change printouts. The first shows that Phase A voltage in channel 3 decreased to 1Ø9.2V at time shown. The second printout shows that phase C voltage increased to 115.4V at time shown.

626	626A,G,R,ARA
2C INC Ø1:Ø2:34.56 115.4 V 3A DEC Ø1:Ø2:34.56 1Ø9.2 V	115.4 V 2C INC Ø1:Ø2:34.56 1Ø9.2 V 3A DEC Ø1:Ø2:34.56

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2.5.4 Voltage Surge

A Voltage Surge is defined as a line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
4B   HI   09:45:33.15
```

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

626	626A,G,R,ARA
↑ 4B NOR 09:45:33.38	SURGE 0.23 SEC
128.2 V MAX	128.2 V MAX ↓
SURGE 0.23 SEC	4B NOR 09:45:33.38

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

2.5.5 Voltage Sag

A voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

NOTE

Voltage inputs less than 25V RMS will be printed out as 0.0V on the 6003.

2.5.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

626	626A,G,R,ARA
↑ 2A IMP 10:12:13.45	+0139 V, 0010 US
+0139 V, 0010 US	2A IMP 10:12:13.45 ↓

This printout indicates that an impulse which deviated from normal line voltage by +139 volts peak and whose duration was 10 microseconds was detected on phase A of Channel 2 at the time shown. The impulse magnitude is measured with respect to the instantaneous point on the power frequency sinewave at which it occurs. Impulse polarity is referenced to "+" and "-" markings on rear panel.

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2.5.7 Frequency Change

A frequency change printout is triggered when the line frequency changes more than a preselected amount from the last printed value. The frequency change sensitivity is a user-selected value between Ø.2 Hz and 3.Ø HZ in Ø.1 HZ increments. The following example shows several frequency change printouts.

626	626A,G,R,ARA
3 FRQ 1Ø:16:27.Ø2	Ø6Ø.5 HZ
Ø6Ø.5 HZ	3 FRQ 1Ø:16:27.Ø2
↑	↓
3 FRQ 1Ø:16:24.32	Ø6Ø.Ø HZ
Ø6Ø.Ø HZ	3 FRQ 1Ø:16:24.32
3 FRQ 1Ø:16:17.Ø2	Ø59.5. HZ
Ø59.5 HZ	3 FRQ 1Ø:16:17.Ø2

2.6 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise. The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in phase A of Channel 1 and that the limits for Channel 1 were programmed as follows:

V LOW LIMIT	1Ø5 Vrms
V HIGH LIMIT	125 Vrms
V SENSITIVITY	2 Vrms

The example printouts are referenced to figures 2-3 and 2-4 which illustrate overvoltage and voltage sag disturbances, respectively.

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

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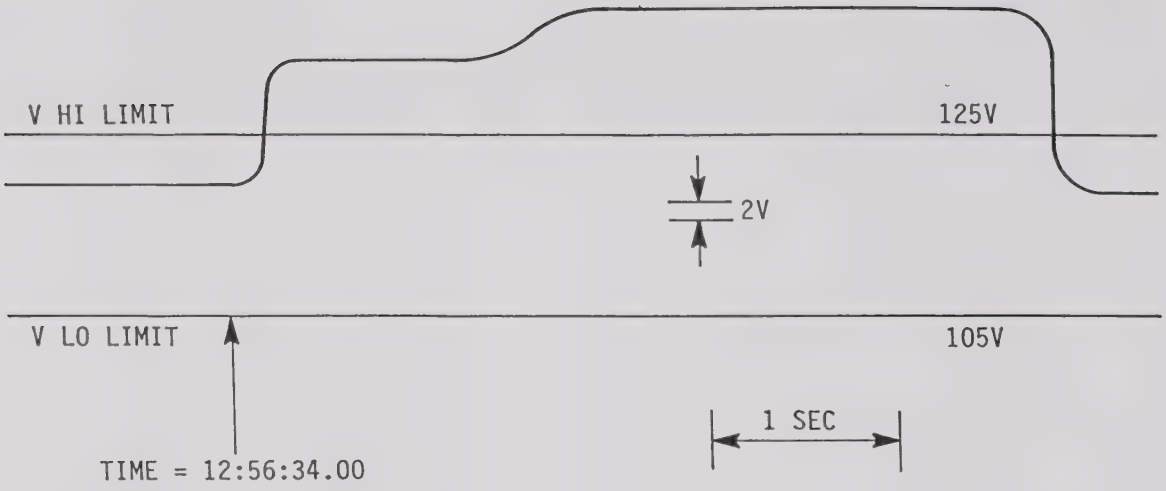

Figure 2-3. Overvoltage Disturbance (6003)

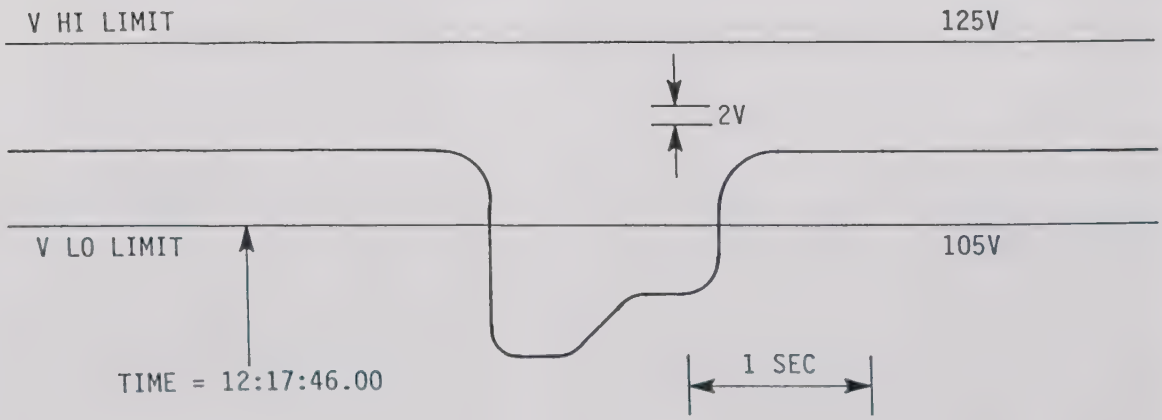

Figure 2-4. Voltage Sag Disturbance (6003)

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The first printout group generated below illustrates overvoltage (fig. 2-3) in the NORMAL mode. The second (3-line) group illustrates overvoltage in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:56:38.51
    139.1  V  MAX

1A  HI    12:56:34.21
```

↑

```
1A  NOR   12:56:38.51
    139.1  V  Max

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3 V

1A  INC   12:56:35.62
    135.3 V

1A  INC   12:56:35.40
    133.3 V

1A  INC   12:56:34.22
    131.3 V

1A  INC   12:56:34.21
    129.2 V

1A  HI    12:56:34.21
```

626A,G,R,ARA

```
1A  HI    12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V   MAX
1A  NOR   12:56:38.51

1A  HI    12:56:34.21

    139.1  V   MAX
1A  NOR   12:56:38.51
```

↓

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The following is a printout of overvoltage (fig. 2-3) in the MAXIMUM DETAIL mode.

626

```
1A  DEC   12:56:38.61
    119.8  V

1A  DEC   12:56:38.53
    121.8  V

1A  DEC   12:56:38.51
    124.0  V

1A  NORM  12::56:38.51
    139.1  V  MAX

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3

1A  INC   12:56:35.62
    135.3  V

1A  INC   12:56:35.40
    133.3  V

1A  INC   12:56:34.22
    131.3  V

1A  INC   12:56:34.21
    129.2  V

1A  HIGH  12:56:34.21

1A  INC   12:56:34.20
    121.1  V

1A  INC   12:50:12.34
    119.0  V
```

626A

```
    119.0  V
1A  INC   12:50:12.34

    121.1  V
1A  INC   12:56:34.20

1A  HIGH  12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V
1A  NORM  12:56:38.51

    124.0  V
1A  DEC   12:56:38.51

    121.8  V
1A  DEC   12:56:38.53

    119.8  V
1A  DEC   12:56:38.61
```


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The first group of generated printouts below illustrates voltage sag (fig. 2-4) in the NORMAL mode. The second group illustrates voltage sag in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:17:48.61
    090.1  V  MIN
    SAG  1.25 SEC

1A  LOW   12:17:47.36


1A  NORM  12:17:48.61
    090.1   V  MIN
    SAG   1.25 SEC

1A  INC   12:17:48.60
    103.1  V

1A  INC  12:17:48.55
    098.0  V

1A  INC   12:17:48.05
    096.0  V

1A  INC   12:17:47.96
    094.0  V

1A  DEC   12:17:47.39
    091.9  V

1A  DEC   12:17:47.37
    094.1  V

1A  DEC   12:17:47.36
    101.3  V

1A  LOW   12:17:47.36
```

626A,G,R,ARA

```
1A  LOW    12:17:47.36

    101.3   V
1A  DEC    12:17:47.36

    094.1   V
1A  DEC    12:17:47.37

    091.9   V
1A  DEC    12:17:47.39

    094.0   V
1A  INC    12:17:47.96

    096.0   V
1A  INC    12:17:48.05

    098.0   V
1A  INC    12:17:48.55

    103.1   V
1A  INC    12:17:48.60

    SAG   1.25 SEC
    090.1   V  MIN
1A  NORM   12:17:48.61


1A   LOW   12:17:47.36

     SAG  1.25 SEC
     090.1  V   MIN
1A   NOR   12:17:48.61
```

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The following printout illustrates voltage sag (fig. 2-4) in the MAXIMUM DETAIL mode.

626

```
1A  DEC   12:27:48.86
    112.1  V

1A  INC   12:17:48.69
    110.0  V

1A  INC   12:17:48.62
    108.1  V

1A  INC   12:17:48.61
    105.9

1A  NORM  12:17:48.61
    090.1   V  MIN
    SAG   1.25  SEC

1A  INC   12:17:48.60
    103.1  V

1   INC   12:17:48.55
    098.0  V

1A  INC   12:17:48.05
    096.0  V

1A  INC   12:17:47.96
    094.0  V

1A  DEC   12:17:47.39
    091.9  V

1A  DEC   12:17:47.37
    094.1  V

1A  DEC   12:17:47.36
    101.3  V

1A  LOW   12:17:47.36

1A  DEC   12:17:47.35
    110.8  V

1A  INC   12:16:32.15
    113.0  V
```

626A,G,R,ARA

```
    113.0  V
1A  INC   12:16:32.15

    110.8  V
1A  DEC   12:17:47.35

1A  LOW   12:17:47.36

    101.3  V
1A  DEC   12:17:47.36

    094.1  V
1A  DEC   12:17:47.37

    091.9  V
1A  DEC   12:17:47.39

    094.0  V
1   INC   12:17:47.96

    096.0  V
1A  INC   12:17:48.05

    098.0  V
1A  INC   12:17:48.55

    103.1  V
1A  INC   12:17:48.60

    SAG   1.25  SEC
    090.1   V  MIN
1A  NORM  12:17:48.61

    105.9  V
1A  INC   12:17:48.61

    108.1  V
1A  INC   12:17:48.62

    110.0  V
1   INC   12:17:48.69

    112.1  V
1   INC   12:27:48.86
```


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SECTION III
OPERATIONAL TEST

3.1 GENERAL

This section provides information for performing an operational test to verify that the 6003 plug-in is operating properly.

3.2 SYSTEM CHECK

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6003. Any inputs connected at this time will be automatically disconnected during the system check period. Successful measurement of these signals verifies that the module is fully operational. Expected system check measurement results and allowable tolerances are listed below.

AC Voltage	196.0-204.0 Volts
Impulse Peak	2700-3300 Volts
Impulse Duration	360-440 uSec
Frequency	59.8-60.2 Hz

3.3 SAMPLE SYSTEM CHECK PRINTOUT

A typical system check printout obtained from a 6006 plug-in is illustrated below.

626

```
******************


IMP- 3008V, 0396US
AC VOLTS    199.4V
       PH C
IMP- 3064V, 0395US
AC VOLTS    199.5V
       PH B
IMP- 3103V, 0397US
AC VOLTS    199.8V
       PH A
FRQ    060.0 HZ
   626-PA-6003
       CH 4

TIME = 00:00:12.10
***SYSTEM CHECK***
```

626A,G,R,ARA

```
***SYSTEM CHECK***
TIME = 00:00:12.10

       CH 4
   626-PA-6003
FRQ    060.0 HZ
       PH A
AC VOLTS    199.8V
IMP- 3103V, 0397US
       PH B
AC VOLTS    199.5V
IMP- 3064V, 0395US
       PH C
AC VOLTS    199.4V
IMP- 3008V, 0396US


******************
```

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1001403

WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110235U-1

VOLUME 1

OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

NOTE: Refer to Volume 2 (Service Manual) of TM-110235U for maintenance data

1 May 1984
(Rev. 1 July 1984)
(Rev. 1 Sept. 1985)
(Rev. 1 May 1986)
(Rev. 15 May 1987)
(Rev. 1 Sept. 1989)
(Rev.B)

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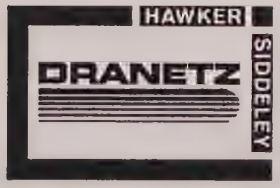

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IMPORTANT! CALIBRATION INTERVAL

The recommended calibration interval for this unit is once every 12 MONTHS.

We recommend that you return the unit to the factory for calibration. If you decide to do so, first contact the Dranetz Customer Service Department to obtain an authorization number.

Telephone Number:	(908) 287-3680
Telex Number:	499-7808
TWX Number:	(908) 997-9553
FAX Number:	(908) 248-9240
Cable:	DRANETZ

Then fill out the Repair/Service Order form enclosed in this manual and ship it along with the unit to the Dranetz Customer Service Department. (If this form is missing, ask the Dranetz Customer Service Department for a replacement.)

STATEMENT OF WARRANTY

ALL PRODUCTS OF DRANETZ TECHNOLOGIES, INC. ARE WARRANTED TO THE ORIGINAL PURCHASER AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. DRANETZ WILL REPAIR OR REPLACE, AT ITS OPTION, ALL DEFECTIVE EQUIPMENT RETURNED, FREIGHT PREPAID, DURING THE WARRANTY PERIOD, WITHOUT CHARGE FOR REPAIR, PROVIDED THERE IS NO EVIDENCE THAT THE EQUIPMENT HAS BEEN MISHANDLED OR ABUSED. THIS WARRANTY SHALL NOT APPLY TO ANY DEFECTS RESULTING FROM IMPROPER OR INADEQUATE MAINTENANCE, BUYER-SUPPLIED HARDWARE/SOFTWARE OR INTERFACING, UNAUTHORIZED MODIFICATION OR MISUSE OF THE EQUIPMENT, OPERATION OUTSIDE OF THE ENVIRONMENTAL SPECIFICATIONS FOR THE PRODUCT, OR IMPROPER SITE PREPARATION OR MAINTENANCE.

The information in this manual has been reviewed and is believed to be entirely reliable. No responsibility, however, is assumed for any inaccuracies. The material in this manual is for information purposes only, and is subject to change without notice.

VOLUME 1
OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

SECTION 1
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual, consists of three sections: I) GENERAL INFORMATION, II) INSTALLATION AND OPERATION, and III) OPERATIONAL CHECK. Volume 2, the Service manual, contains the maintenance instructions.

1.2 INTRODUCTION

This manual provides operating instructions for the 626-PA-6003 Plug-in, hereinafter referred to as the 6003, used in the Series 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in Volume 1 of the Mainframe manual.

1.3 PURPOSE

The 6003 monitors disturbances on 3-phase AC power lines with either 50 or 60 Hz nominal frequency. Each phase is monitored on a single voltage range of 0 to 600 V RMS. With thresholds programmed by the user, the 6003 monitors both short and long term power line disturbances. With this plug-in, the unit stores, analyzes, classifies and prints out quantative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The plug-in monitors any 3-phase power line whose RMS values range from a low value of 0 volts to as high as 600 volts. Three types of disturbances are monitored by the 6003: power line frequency, power frequency transients and waveform disturbances. Power frequency transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses", include all conditions that cause the power line waveform to deviate from an ideal waveform. The 6003 measures the peak amplitude of impulses, their polarity and duration. The threshold value of each type of disturbance, as well as the line frequency, above which detection and printout occurs is operator programmable. (All threshold settings are common to all three line phases.) Except for an automatic summary printout at the end of day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of the day. This feature permits long term unattended operation.

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The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

NOTE: Frequency measurements are derived from phase A only. Therefore, if single-phase monitoring is desired, phase A should be used.

1.4 APPLICATIONS

When installed in the 626 mainframe, the 6003 provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the instrument permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

b. To perform pre-installation site surveys. The 6003 can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable instrument, particularly well suited for field use, is ideal for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the instrument provides a clear record of the quality of power supplied during unattended periods.

1.5 EQUIPMENT CHARACTERISTICS

The 6003 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in one of four slots of the Series 626 Universal Disturbance Analyzer. Technical specifications of the 6003 are presented in Table 1-1.

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Table 1-1. 626-PA-6003 Technical Specifications

Input	2 wire differential Z_{in} = 40 Megohms plus 40 pf (each side to ground)
Input Voltage Range	50-600V RMS
Lower Limit of User-Set Voltage (V_{LOW})	50V to 599V
Upper Limit of User-Set voltage (V_{HIGH})	600V to 51V
Voltage Change Sensitivity (V_{SENS}) (1V Increments)	2 to 60V
Line Voltage Measurement Resolution	0.2V
Line Voltage Measurement Accuracy	±1% of reading, ±0.2% of full scale (75V to 600V)
Line Frequency	
Range	45-65 Hz
Resolution	±0.1 Hz
Accuracy	±0.1 Hz
Impulse Range	50-4000V Pk (1-2000 uSec)
Impulse Peak Resolution	1V
Impulse Accuracy	±10% of reading ±1% F.S. (5 uSec-50 uSec.) (decreasing to ±6 dB from 1 uSec to 2 mSec) 100V-4000V
Impulse Duration Range	1 uSec to 2 mSec
Impulse Duration Resolution	1 uSec

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1.6 STANDARD ACCESSORIES

Model No.	Part No.	Quan.	Description
626PA6003-1 (Barrier, Block Connections)	TM110235U (Vol. 1)	1	Operating Manual
626PA6003-2 (Plug-type Connections)	TM110235U (Vol. 1)	1	Operating Manual
	110480-G1	3	A.C. Cables

1.7 OPTIONAL ACCESSORIES

Part No.	Quan.	Description
TM-110235U (Vol. 2)	1	Service (Maintenance Manual)

1.8 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Customer Service Department in order to obtain an Authorization Number.

   Telephone No: (908) 287-3680

   TWX: (908) 997-9553

   FAX: (908) 248-9240

   Telex: 499-7808

   Cable: DRANETZ

2. Fill out the REPAIR/SERVICE ORDER enclosed in this manual and ship it with the malfunctioning equipment to the Dranetz Customer Service Department.

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SECTION II
INSTALLATION AND OPERATION

2.1 INSTALLATION

2.1.1 Selection of Nominal Operation Frequency

Factory set switches in the 6003 optimize the measurements for a nominal frequency of either 50 or 60 Hz. Figure 2-1 locates these switches on the Analog board of the module. Dots on switches on the figure indicate which side of the switch is to be depressed for 60 Hz. For 50 Hz operation, simply reverse all switch positions.

2.1.2 Installation of 6003 in Mainframe

CAUTION: Be sure that all power is removed from the 626 and modules.

a. With the rear panel markings reading correctly, carefully slide the module into the desired slot, with the Digital board within the card-guide tracks until it is firmly seated.

b. Tighten the top and bottom captive screws to secure the module into the mainframe.

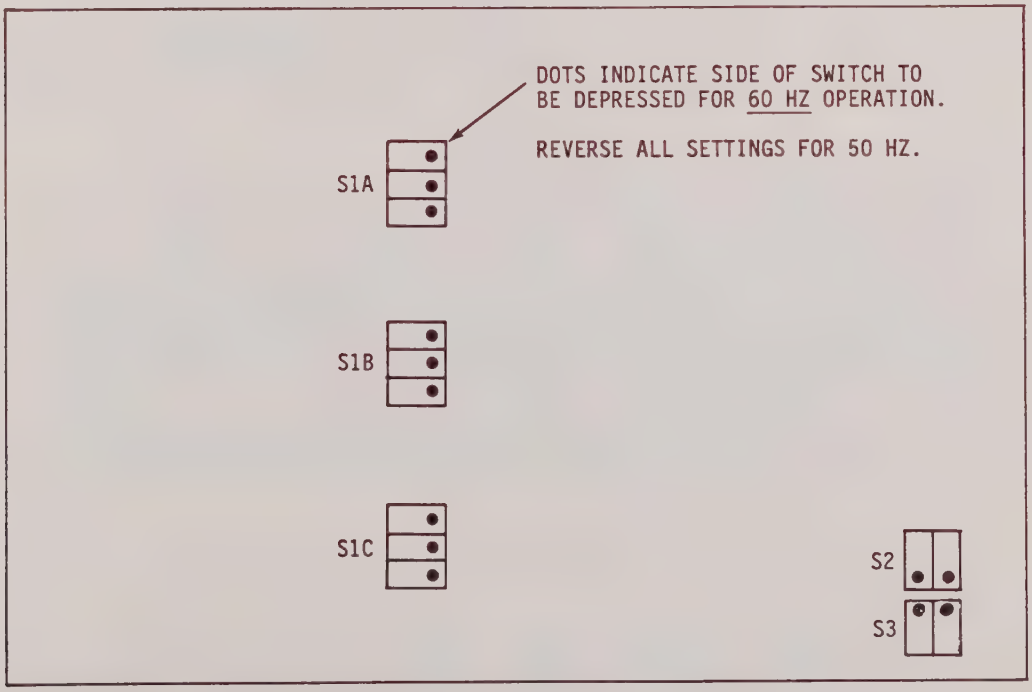

Figure 2-1. Analog Board Switch Locations

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2.1.3 LOAD RATINGS

The Series 626 standard mainframe has an upper limit of the combined total rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating	Plug-in	Load Rating
626-PA-6001	2 Units	626-PA-60012A	3 Units
626-PA-6001 with Extra Option Board	3 Units	626-PA-6013	2 Units
626-PA-6002	2 Units	626-PA-6014	1 Unit
626-PA-6003	4 Units	626-PA-6015	4 Units
626-PA-6005	2 Units	626-PA-6018	4 Units
626-PA-6006	2 Units	626-PA-6020	4 Units
626-PA-6007	1 Unit	626-PA-6024A	4 Units
626-PA-6008	2 Units	626-PA-6024B	4 Units
626-PA-6009	4 Units	626-PA-6025	4 Units
626-PA-6011	1 Unit	626-PA-6030	6 Units
626-PA-6012	2 Units	626-PA-6037	1 Unit
		626-PA-6038	1 Unit
		626-PA-6040	6 Units

NOTE

When selecting modules for installation in any mainframe, verify that the sum of the load ratings of the installed modules DOES NOT exceed 20.

2.2 CONNECTING POWER SOURCE TO MODULE

2.2.1 Connection Procedure

The 6003 is equipped with either three rear panel AC connectors, or a barrier block. Inputs include phase A, B, and C. Connectors must be wired in accordance with the rear panel connector markings (AC high, AC low, and earth ground from top to bottom).

a. Turn the 626 off by inserting the key in FUNCTION key switch on front panel of mainframe and setting the switch to the OFF position.

b. Turn off power source that is to be monitored by the module.

c. Make all connections to the 6003 module first. If the 6003 has been supplied with connectors, merely insert the mating connector, supplied with the unit, until a "click" is heard.

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If the 6003 has been supplied with a barrier block, make all connections to the barrier block first, then be sure to replace the barrier block cover. DO NOT PROCEED UNTIL PARAGRAPH C IS COMPLETE.

d. Make the desired connections to the power source to be monitored.

e. Power up the 626 by turning the FUNCTION key switch to the OPERATE position.

f. Turn on power source to be monitored.

WARNING: Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) and/or any other requirements applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

CAUTION: To avoid damaging the equipment, do not apply AC voltages in excess of 600V RMS to any AC phase input (A,B, or C) of the 6003.

2.2.2 Circuit Applications

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

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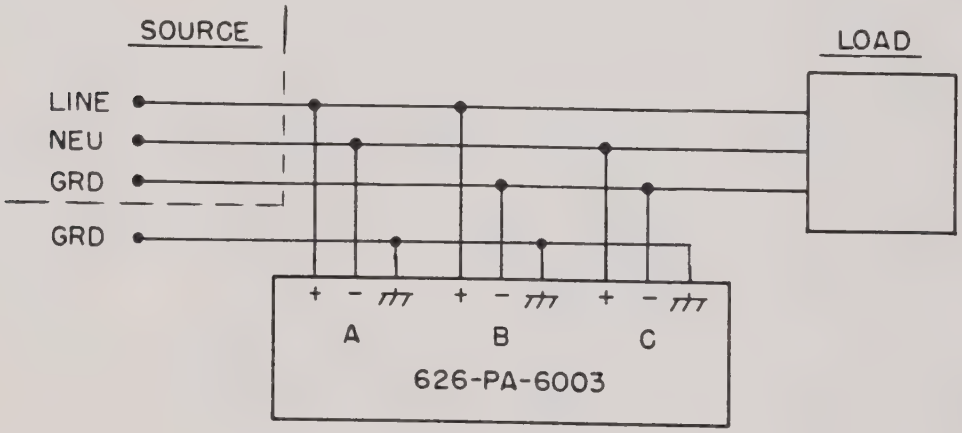
The 3-phase AC monitor for 45-65 Hz may be used for 30 Wye, 30 Delta, or for up to three separate AC signals. It may be used by itself to do Normal Mode/Common Mode analysis on 1 phase lines, or in combination with a 626-PA-6006 to do Normal Mode/Common Mode analysis on a 3 phase wye line.



1 Phase Normal Mode/Common Mode

Readings:

Channel A: LINE-Neutral
Channel B: LINE-Ground
Channel C: Neutral-Ground

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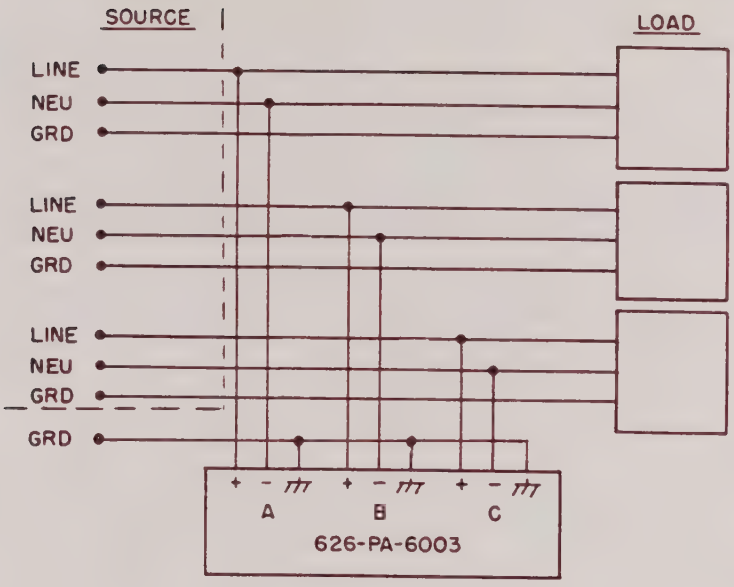
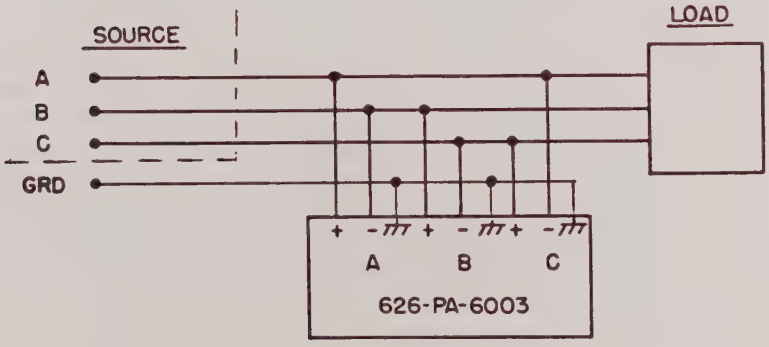


3 Separate AC Lines

Notes

1. All Channels are monitored independently.
2. All line frequencies must be the same.
3. All 3 channels will have same program set-up.



3 Phase Delta

Notes

1. Delta may be grounded or ungrounded
2. Set 626-PA-6003 to monitor line-to-line voltage
   e.g.: For 240 volt delta, set High and Low Limits
   to either side of 240 VAC.

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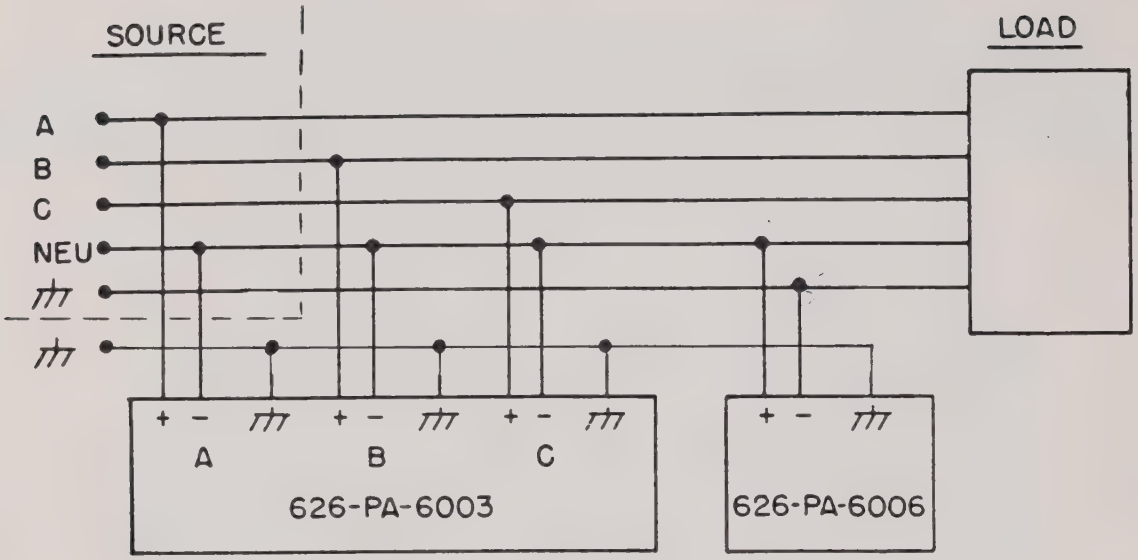

3 Phase Wye

Notes

1. 626-PA-6006 is added to perform Neutral-Ground (COMMON mode) monitoring.

2. Wye distribution is normally monitored Line-to-Neutral, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 120.

3. To monitor wye system line-to-line, set High and Low Limits to either side of higher stated voltage, and connect to 626-PA-6003 as though lines A, B, and C were from a delta, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 208.

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2.2.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious Impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of Impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade Potential Transformers for monitoring Impulses on high voltage power lines is not recommended. The limited frequency response of most Potential Transformers may result in substantial variation of Impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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2.3 OPERATING THE 6003

2.3.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6003 operation are described in Table 2-1. Figure 2-2 shows the Series 626 controls used by the 6003 module. For a description of controls common to overall Model 626 operation, refer to Volume 1 of the Mainframe manual.

2.3.2 Programming Procedure

Assume it is desired to program a high limit of 125V, a low limit of 105V, voltage sensitivity of 2 volts, frequency sensitivity of 0.2 Hz and an impulse sensitivity of 50V. Voltage and frequency sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 25 volts, a disturbance is recorded when impulse amplitude rises above 25 volts.

NOTE

1. It is recommended that the HI and LO limits be set to at least 3V (respectively) from the nominal voltage being measured. For example, if monitoring 120V, the high and low limits should be 117V (or less) and 123V (or more), respectively.

2. It is also recommended that the sensitivity be set to at least 2% of the nominal input voltage.

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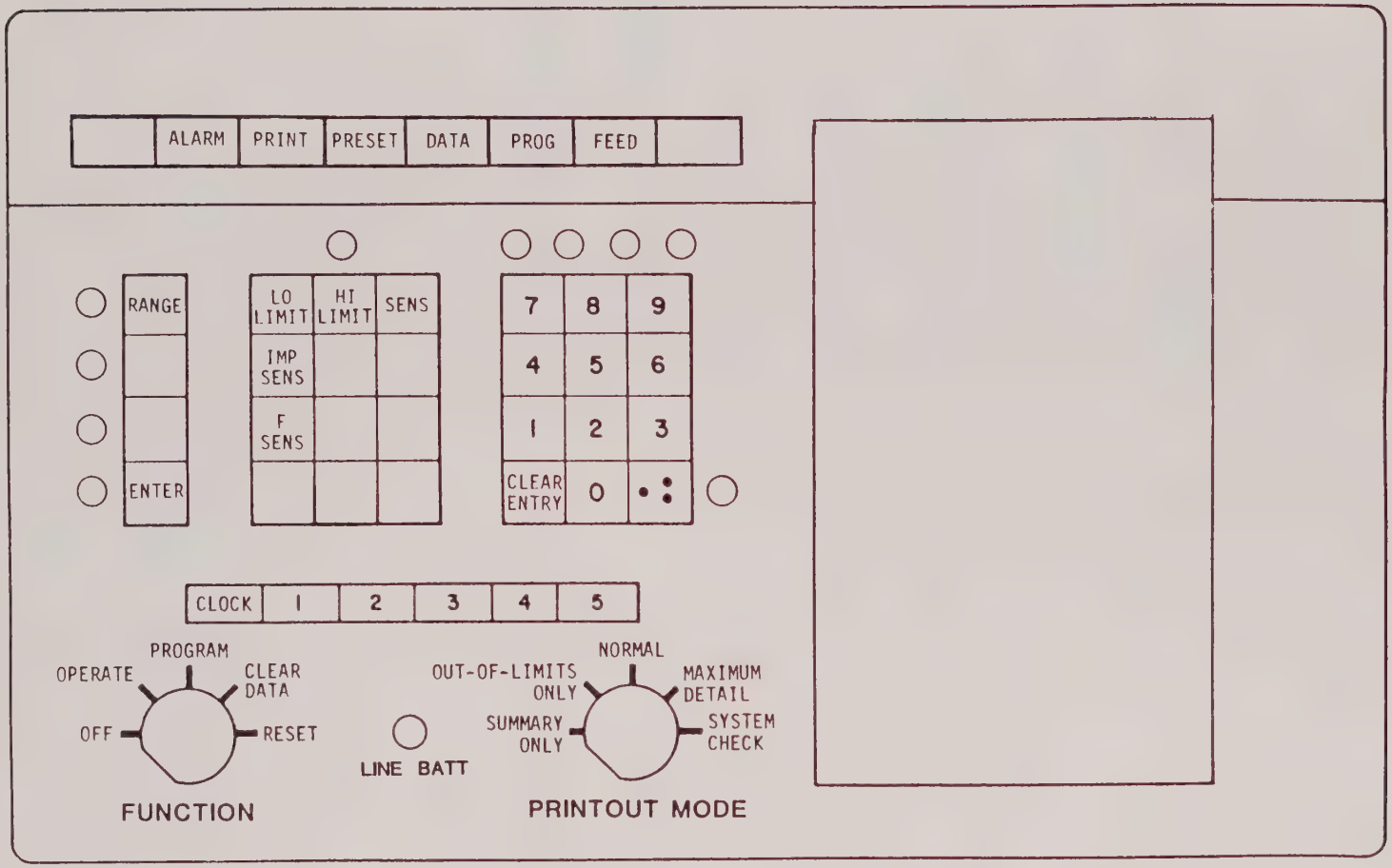

Figure 2-2. Series 626 Controls Used by the 6003 Plug-In

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Table 2-1. 6003 Operating Controls

Item	Function
LO LIMIT pushbutton	When depressed, enables numeric keyboard to program low limit voltage.
HI LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
F SENS pushbutton	When depressed, enables numeric keyboard to program frequency sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6003 memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel.

For the example cited, program the 6003 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that a cueing indicator above the center bank of pushbuttons lights. This indicates that a function may be programmed.

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d. Depress the HI LIMIT pushbutton. Program the high limit value (125), using the keyboard.

e. When the ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout and the ENTER indicator will go out.

f. Repeat steps c, d and e for the low limit voltage (105V) using the LO LIMIT pushbutton.

g. Repeat steps c, d and e for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 02.

h. Repeat steps c, d and e for the frequency sensitivity (0.2 Hz), using the F SENS pushbutton and programming the value as 0.2.

i. Repeat steps c, d and e for the impulse sensitivity (0050 volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

626	
IMPULSE SENS	0050V
FREQ SENS	00.2 HZ
VOLTAGE SENS	002 V
V LOW LIMIT	105 V
V HIGH LIMIT	125 V
626-PA-6003	
CH 4	

626A,G,R,ARA	
CH 4	
626-PA-6003	
V HIGH LIMIT	125V
V LOW LIMIT	105V
VOLTAGE SENS	002 V
FREQ SENS	00.2 HZ
IMPULSE SENS	0050V

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits.

j. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

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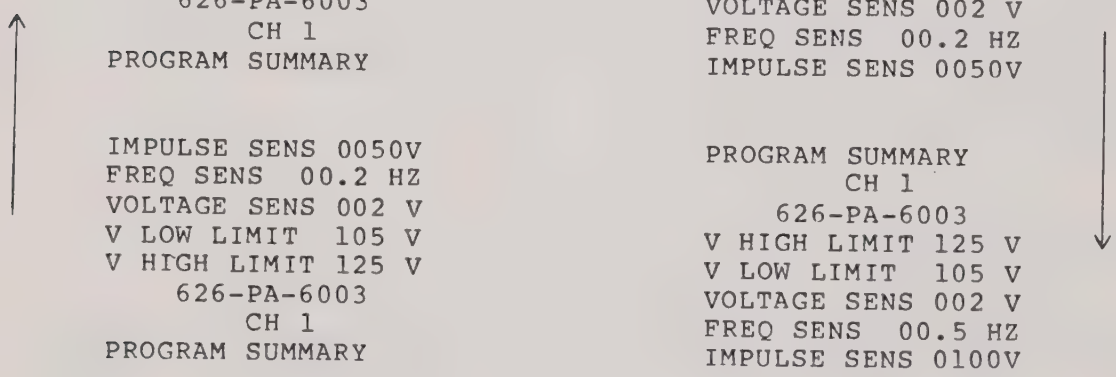
2.4 SELECTING THE FACTORY PRESET PROGRAM

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below. The printout group generated first is the operator program; the second is the factory program printed after the PRESET button is pressed.



2.5 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6003, it is recorded and displayed in characteristic manner.

2.5.1 Overvoltage

An overvoltage condition exists when the monitored power line voltage exceeds the user-specified upper limit for more than 2.55 seconds. An overvoltage condition is indicated by a printout such as the following:

4B HI 09:46:07.11

where 4 is the channel number, B is the phase and time is given in hours, minutes and seconds (to .01 sec resolution).

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When the line voltage recovers to normal, a printout such as the following occurs:

626	626A,G,R,ARA
4B NOR Ø9:46:15.2Ø 148.6 V MAX	148.6 V MAX 4B NOR Ø9:46:15.2Ø

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

2.5.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. An undervoltage condition is indicated by a printout such as the following:

```
4C  LO   Ø9:46:15.2Ø
```

When the line voltage returns to normal level, a message such as the following is printed:

626	626A,G,R,ARA
4C NOR Ø9:46:18.45 36.4 V MIN	36.4 V MIN 4C NOR Ø9:46:18.45

indicating when normal voltlage was restored and the value of the lowest voltage reached during the undervoltage interval.

2.5.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected integer voltage between one and 15 volts for a 115-volt line. The following example shows several voltage change printouts. The first shows that Phase A voltage in channel 3 decreased to 109.2V at time shown. The second printout shows that phase C voltage increased to 115.4V at time shown.

626	626A,G,R,ARA
2C INC Ø1:Ø2:34.56 115.4 V	115.4 V 2C INC Ø1:Ø2:34.56
3A DEC Ø1:Ø2:34.56 1Ø9.2 V	1Ø9.2 V 3A DEC Ø1:Ø2:34.56

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2.5.4 Voltage Surge

A Voltage Surge is defined as a line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
4B   HI   09:45:33.15
```

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

626	626A,G,R,ARA
↑ 4B NOR 09:45:33.38	SURGE 0.23 SEC
128.2 V MAX	128.2 V MAX
SURGE 0.23 SEC	4B NOR 09:45:33.38 ↓

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

2.5.5 Voltage Sag

A voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

NOTE

Voltage inputs less than 25V RMS will be printed out as 0.0V on the 6003.

2.5.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

626	626A,G,R,ARA
↑ 2A IMP 10:12:13.45	+0139 V, 0010 US
+0139 V, 0010 US	2A IMP 10:12:13.45 ↓

This printout indicates that an impulse which deviated from normal line voltage by +139 volts peak and whose duration was 10 microseconds was detected on phase A of Channel 2 at the time shown. The impulse magnitude is measured with respect to the instantaneous point on the power frequency sinewave at which it occurs. Impulse polarity is referenced to "+" and "-" markings on rear panel.

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2.5.7 Frequency Change

A frequency change printout is triggered when the line frequency changes more than a preselected amount from the last printed value. The frequency change sensitivity is a user-selected value between Ø.2 Hz and 3.Ø HZ in Ø.1 HZ increments. The following example shows several frequency change printouts.

626	626A,G,R,ARA
3 FRQ 1Ø:16:27.Ø2	Ø6Ø.5 HZ
Ø6Ø.5 HZ	3 FRQ 1Ø:16:27.Ø2
3 FRQ 1Ø:16:24.32	Ø6Ø.Ø HZ
Ø6Ø.Ø HZ	3 FRQ 1Ø:16:24.32
3 FRQ 1Ø:16:17.Ø2	Ø59.5. HZ
Ø59.5 HZ	3 FRQ 1Ø:16:17.Ø2

2.6 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise. The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in phase A of Channel 1 and that the limits for Channel 1 were programmed as follows:

V LOW LIMIT	1Ø5 Vrms
V HIGH LIMIT	125 Vrms
V SENSITIVITY	2 Vrms

The example printouts are referenced to figures 2-3 and 2-4 which illustrate overvoltage and voltage sag disturbances, respectively.

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

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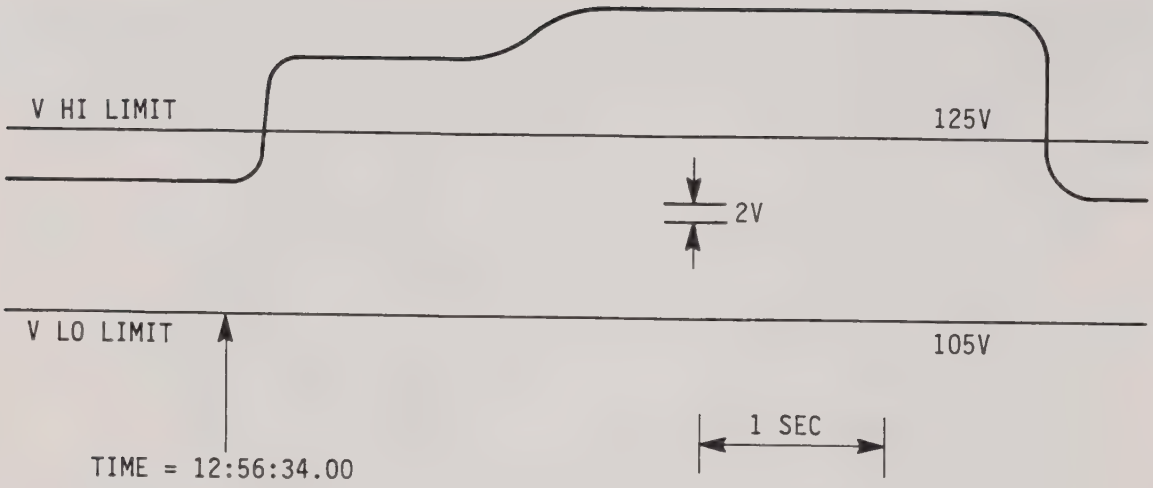

Figure 2-3. Overvoltage Disturbance (6003)

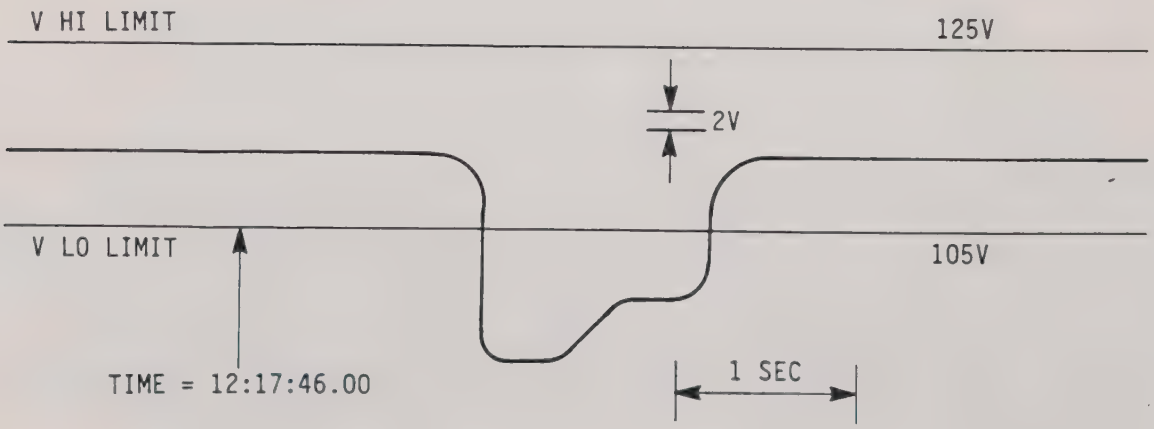

Figure 2-4. Voltage Sag Disturbance (6003)

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The first printout group generated below illustrates overvoltage (fig. 2-3) in the NORMAL mode. The second (3-line) group illustrates overvoltage in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:56:38.51
    139.1  V  MAX

1A  HI    12:56:34.21
```

626A,G,R,ARA

```
1A  HI    12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V   MAX
1A  NOR   12:56:38.51
```

```
1A  NOR   12:56:38.51
    139.1  V  Max

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3 V

1A  INC   12:56:35.62
    135.3 V

1A  INC   12:56:35.40
    133.3 V

1A  INC   12:56:34.22
    131.3 V

1A  INC   12:56:34.21
    129.2 V

1A  HI    12:56:34.21
```

```
1A  HI    12:56:34.21

    139.1  V   MAX
1A  NOR   12:56:38.51
```

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The following is a printout of overvoltage (fig. 2-3) in the MAXIMUM DETAIL mode.

626

```
1A  DEC   12:56:38.61
    119.8  V

1A  DEC   12:56:38.53
    121.8  V

1A  DEC   12:56:38.51
    124.0  V

1A  NORM  12::56:38.51
    139.1  V  MAX

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3

1A  INC   12:56:35.62
    135.3  V

1A  INC   12:56:35.40
    133.3  V

1A  INC   12:56:34.22
    131.3  V

1A  INC   12:56:34.21
    129.2  V

1A  HIGH  12:56:34.21

1A  INC   12:56:34.20
    121.1  V

1A  INC   12:50:12.34
    119.0  V
```

626A

```
    119.0  V
1A  INC   12:50:12.34

    121.1  V
1A  INC   12:56:34.20

1A  HIGH  12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V
1A  NORM  12:56:38.51

    124.0  V
1A  DEC   12:56:38.51

    121.8  V
1A  DEC   12:56:38.53

    119.8  V
1A  DEC   12:56:38.61
```


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The first group of generated printouts below illustrates voltage sag (fig. 2-4) in the NORMAL mode. The second group illustrates voltage sag in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:17:48.61
    Ø9Ø.1  V  MIN
    SAG  1.25 SEC

1A  LOW   12:17:47.36


1A  NORM  12:17:48.61
    Ø9Ø.1   V  MIN
    SAG   1.25 SEC

1A  INC   12:17:48.6Ø
    1Ø3.1  V

1A  INC  12:17:48.55
    Ø98.Ø  V

1A  INC   12:17:48.Ø5
    Ø96.Ø  V

1A  INC   12:17:47.96
    Ø94.Ø  V

1A  DEC   12:17:47.39
    Ø91.9  V

1A  DEC   12:17:47.37
    Ø94.1  V

1A  DEC   12:17:47.36
    1Ø1.3  V

1A  LOW   12:17:47.36
```

626A,G,R,ARA

```
1A  LOW    12:17:47.36

    1Ø1.3   V
1A  DEC    12:17:47.36

    Ø94.1   V
1A  DEC    12:17:47.37

    Ø91.9   V
1A  DEC    12:17:47.39

    Ø94.Ø   V
1A  INC    12:17:47.96

    Ø96.Ø   V
1A  INC    12:17:48.Ø5

    Ø98.Ø   V
1A  INC    12:17:48.55

    1Ø3.1   V
1A  INC    12:17:48.6Ø

    SAG   1.25 SEC
    Ø9Ø.1   V  MIN
1A  NORM   12:17:48.61


1A   LOW   12:17:47.36

     SAG  1.25 SEC
     Ø9Ø.1  V   MIN
1A   NOR   12:17:48.61
```

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The following printout illustrates voltage sag (fig. 2-4) in the MAXIMUM DETAIL mode.

626

```
1A  DEC   12:27:48.86
    112.1  V

1A  INC   12:17:48.69
    110.0  V

1A  INC   12:17:48.62
    108.1  V

1A  INC   12:17:48.61
    105.9

1A  NORM  12:17:48.61
    090.1   V  MIN
    SAG   1.25  SEC

1A  INC   12:17:48.60
    103.1  V

1   INC   12:17:48.55
    098.0  V

1A  INC   12:17:48.05
    096.0  V

1A  INC   12:17:47.96
    094.0  V

1A  DEC   12:17:47.39
    091.9  V

1A  DEC   12:17:47.37
    094.1  V

1A  DEC   12:17:47.36
    101.3  V

1A  LOW   12:17:47.36

1A  DEC   12:17:47.35
    110.8  V

1A  INC   12:16:32.15
    113.0  V
```

626A,G,R,ARA

```
    113.0  V
1A  INC   12:16:32.15

    110.8  V
1A  DEC   12:17:47.35

1A  LOW   12:17:47.36

    101.3  V
1A  DEC   12:17:47.36

    094.1  V
1A  DEC   12:17:47.37

    091.9  V
1A  DEC   12:17:47.39

    094.0  V
1   INC   12:17:47.96

    096.0  V
1A  INC   12:17:48.05

    098.0  V
1A  INC   12:17:48.55

    103.1  V
1A  INC   12:17:48.60

    SAG   1.25  SEC
    090.1   V  MIN
1A  NORM  12:17:48.61

    105.9  V
1A  INC   12:17:48.61

    108.1  V
1A  INC   12:17:48.62

    110.0  V
1   INC   12:17:48.69

    112.1  V
1   INC   12:27:48.86
```


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SECTION III
OPERATIONAL TEST

3.1 GENERAL

This section provides information for performing an operational test to verify that the 6003 plug-in is operating properly.

3.2 SYSTEM CHECK

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6003. Any inputs connected at this time will be automatically disconnected during the system check period. Successful measurement of these signals verifies that the module is fully operational. Expected system check measurement results and allowable tolerances are listed below.

AC Voltage	196.0-204.0 Volts
Impulse Peak	2700-3300 Volts
Impulse Duration	360-440 uSec
Frequency	59.8-60.2 Hz

3.3 SAMPLE SYSTEM CHECK PRINTOUT

A typical system check printout obtained from a 6006 plug-in is illustrated below.

<u>626</u>

```
******************


IMP- 3008V, 0396US
AC VOLTS    199.4V
       PH C
IMP- 3064V, 0395US
AC VOLTS    199.5V
       PH B
IMP- 3103V, 0397US
AC VOLTS    199.8V
       PH A
FRQ    060.0 HZ
   626-PA-6003
       CH 4

TIME = 00:00:12.10
***SYSTEM CHECK***
```

<u>626A,G,R,ARA</u>

```
***SYSTEM CHECK***
TIME = 00:00:12.10

       CH 4
   626-PA-6003
FRQ    060.0 HZ
       PH A
AC VOLTS    199.8V
IMP- 3103V, 0397US
       PH B
AC VOLTS    199.5V
IMP- 3064V, 0395US
       PH C
AC VOLTS    199.4V
IMP- 3008V, 0396US


******************
```

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110235U-1

VOLUME 1

OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

NOTE: Refer to Volume 2 (Service Manual) of TM-110235U for maintenance data

1 May 1984
(Rev. 1 July 1984)
(Rev. 1 Sept. 1985)
(Rev. 1 May 1986)
(Rev. 15 May 1987)
(Rev. 1 Sept. 1989)
(Rev.B)

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IMPORTANT! CALIBRATION INTERVAL

The recommended calibration interval for this unit is once every 12 MONTHS.

We recommend that you return the unit to the factory for calibration. If you decide to do so, first contact the Dranetz Customer Service Department to obtain an authorization number.

Telephone Number:	(908) 287-3680
Telex Number:	499-7808
TWX Number:	(908) 997-9553
FAX Number:	(908) 248-9240
Cable:	DRANETZ

Then fill out the Repair/Service Order form enclosed in this manual and ship it along with the unit to the Dranetz Customer Service Department. (If this form is missing, ask the Dranetz Customer Service Department for a replacement.)

STATEMENT OF WARRANTY

ALL PRODUCTS OF DRANETZ TECHNOLOGIES, INC. ARE WARRANTED TO THE ORIGINAL PURCHASER AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. DRANETZ WILL REPAIR OR REPLACE, AT ITS OPTION, ALL DEFECTIVE EQUIPMENT RETURNED, FREIGHT PREPAID, DURING THE WARRANTY PERIOD, WITHOUT CHARGE FOR REPAIR, PROVIDED THERE IS NO EVIDENCE THAT THE EQUIPMENT HAS BEEN MISHANDLED OR ABUSED. THIS WARRANTY SHALL NOT APPLY TO ANY DEFECTS RESULTING FROM IMPROPER OR INADEQUATE MAINTENANCE, BUYER-SUPPLIED HARDWARE/SOFTWARE OR INTERFACING, UNAUTHORIZED MODIFICATION OR MISUSE OF THE EQUIPMENT, OPERATION OUTSIDE OF THE ENVIRONMENTAL SPECIFICATIONS FOR THE PRODUCT, OR IMPROPER SITE PREPARATION OR MAINTENANCE.

The information in this manual has been reviewed and is believed to be entirely reliable. No responsibility, however, is assumed for any inaccuracies. The material in this manual is for information purposes only, and is subject to change without notice.

VOLUME 1
OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

SECTION 1
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual, consists of three sections: I) GENERAL INFORMATION, II) INSTALLATION AND OPERATION, and III) OPERATIONAL CHECK. Volume 2, the Service manual, contains the maintenance instructions.

1.2 INTRODUCTION

This manual provides operating instructions for the 626-PA-6003 Plug-in, hereinafter referred to as the 6003, used in the Series 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in Volume 1 of the Mainframe manual.

1.3 PURPOSE

The 6003 monitors disturbances on 3-phase AC power lines with either 50 or 60 Hz nominal frequency. Each phase is monitored on a single voltage range of 0 to 600 V RMS. With thresholds programmed by the user, the 6003 monitors both short and long term power line disturbances. With this plug-in, the unit stores, analyzes, classifies and prints out quantative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The plug-in monitors any 3-phase power line whose RMS values range from a low value of 0 volts to as high as 600 volts. Three types of disturbances are monitored by the 6003: power line frequency, power frequency transients and waveform disturbances. Power frequency transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses", include all conditions that cause the power line waveform to deviate from an ideal waveform. The 6003 measures the peak amplitude of impulses, their polarity and duration. The threshold value of each type of disturbance, as well as the line frequency, above which detection and printout occurs is operator programmable. (All threshold settings are common to all three line phases.) Except for an automatic summary printout at the end of day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of the day. This feature permits long term unattended operation.

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The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

NOTE: Frequency measurements are derived from phase A only. Therefore, if single-phase monitoring is desired, phase A should be used.

1.4 APPLICATIONS

When installed in the 626 mainframe, the 6003 provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the instrument permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

b. To perform pre-installation site surveys. The 6003 can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable instrument, particularly well suited for field use, is ideal for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the instrument provides a clear record of the quality of power supplied during unattended periods.

1.5 EQUIPMENT CHARACTERISTICS

The 6003 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in one of four slots of the Series 626 Universal Disturbance Analyzer. Technical specifications of the 6003 are presented in Table 1-1.

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Table 1-1. 626-PA-6003 Technical Specifications

Input	2 wire differential Z_{in} = 40 Megohms plus 40 pf (each side to ground)
Input Voltage Range	50-600V RMS
Lower Limit of User-Set Voltage (V_{LOW})	50V to 599V
Upper Limit of User-Set voltage (V_{HIGH})	600V to 51V
Voltage Change Sensitivity (V_{SENS}) (1V Increments)	2 to 60V
Line Voltage Measurement Resolution	0.2V
Line Voltage Measurement Accuracy	±1% of reading, ±0.2% of full scale (75V to 600V)
Line Frequency	
Range	45-65 Hz
Resolution	±0.1 Hz
Accuracy	±0.1 Hz
Impulse Range	50-4000V Pk (1-2000 uSec)
Impulse Peak Resolution	1V
Impulse Accuracy	±10% of reading ±1% F.S. (5 uSec-50 uSec.) (decreasing to ±6 dB from 1 uSec to 2 mSec) 100V-4000V
Impulse Duration Range	1 uSec to 2 mSec
Impulse Duration Resolution	1 uSec

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1.6 STANDARD ACCESSORIES

Model No.	Part No.	Quan.	Description
626PA6003-1 (Barrier, Block Connections)	TM110235U (Vol. 1)	1	Operating Manual
626PA6003-2 (Plug-type Connections)	TM110235U (Vol. 1)	1	Operating Manual
	110480-G1	3	A.C. Cables

1.7 OPTIONAL ACCESSORIES

Part No.	Quan.	Description
TM-110235U (Vol. 2)	1	Service (Maintenance Manual)

1.8 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Customer Service Department in order to obtain an Authorization Number.

   Telephone No: (908) 287-3680

   TWX: (908) 997-9553

   FAX: (908) 248-9240

   Telex: 499-7808

   Cable: DRANETZ

2. Fill out the REPAIR/SERVICE ORDER enclosed in this manual and ship it with the malfunctioning equipment to the Dranetz Customer Service Department.

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SECTION II
INSTALLATION AND OPERATION

2.1 INSTALLATION

2.1.1 Selection of Nominal Operation Frequency

Factory set switches in the 6003 optimize the measurements for a nominal frequency of either 50 or 60 Hz. Figure 2-1 locates these switches on the Analog board of the module. Dots on switches on the figure indicate which side of the switch is to be depressed for 60 Hz. For 50 Hz operation, simply reverse all switch positions.

2.1.2 Installation of 6003 in Mainframe

CAUTION: Be sure that all power is removed from the 626 and modules.

a. With the rear panel markings reading correctly, carefully slide the module into the desired slot, with the Digital board within the card-guide tracks until it is firmly seated.

b. Tighten the top and bottom captive screws to secure the module into the mainframe.

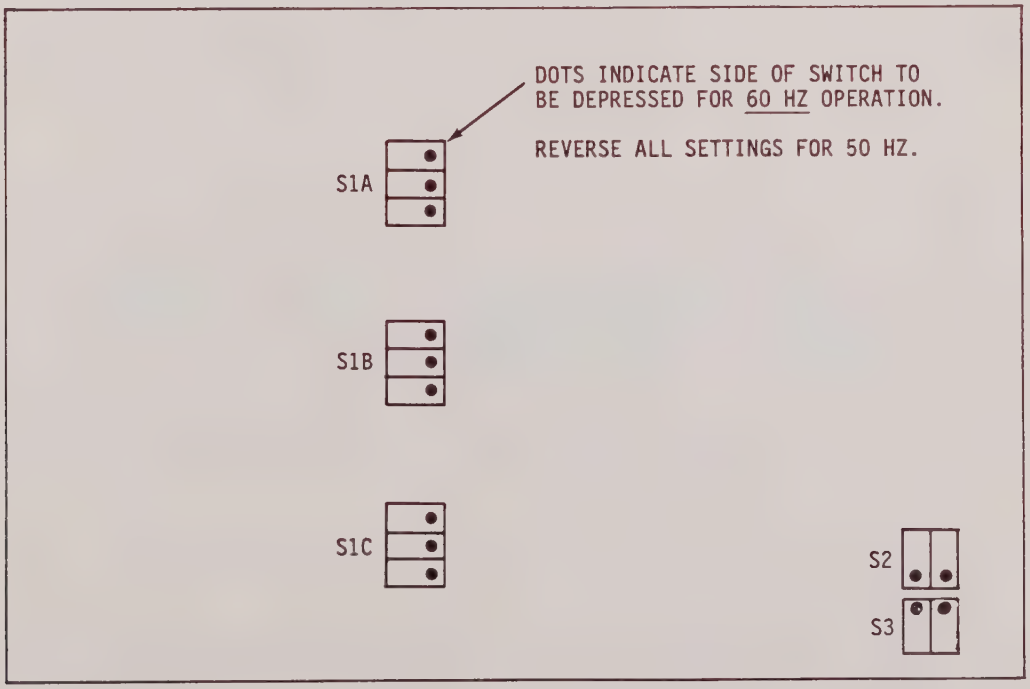

Figure 2-1. Analog Board Switch Locations

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2.1.3 LOAD RATINGS

The Series 626 standard mainframe has an upper limit of the combined total rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating	Plug-in	Load Rating
626-PA-6001	2 Units	626-PA-60012A	3 Units
626-PA-6001		626-PA-6013	2 Units
with Extra		626-PA-6014	1 Unit
Option Board	3 Units	626-PA-6015	4 Units
626-PA-6002	2 Units	626-PA-6018	4 Units
626-PA-6003	4 Units	626-PA-6020	4 Units
626-PA-6005	2 Units	626-PA-6024A	4 Units
626-PA-6006	2 Units	626-PA-6024B	4 Units
626-PA-6007	1 Unit	626-PA-6025	4 Units
626-PA-6008	2 Units	626-PA-6030	6 Units
626-PA-6009	4 Units	626-PA-6037	1 Unit
626-PA-6011	1 Unit	626-PA-6038	1 Unit
626-PA-6012	2 Units	626-PA-6040	6 Units

NOTE

When selecting modules for installation in any mainframe, verify that the sum of the load ratings of the installed modules DOES NOT exceed 20.

2.2 CONNECTING POWER SOURCE TO MODULE

2.2.1 Connection Procedure

The 6003 is equipped with either three rear panel AC connectors, or a barrier block. Inputs include phase A, B, and C. Connectors must be wired in accordance with the rear panel connector markings (AC high, AC low, and earth ground from top to bottom).

a. Turn the 626 off by inserting the key in FUNCTION key switch on front panel of mainframe and setting the switch to the OFF position.

b. Turn off power source that is to be monitored by the module.

c. Make all connections to the 6003 module first. If the 6003 has been supplied with connectors, merely insert the mating connector, supplied with the unit, until a "click" is heard.

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If the 6003 has been supplied with a barrier block, make all connections to the barrier block first, then be sure to replace the barrier block cover. DO NOT PROCEED UNTIL PARAGRAPH C IS COMPLETE.

d. Make the desired connections to the power source to be monitored.

e. Power up the 626 by turning the FUNCTION key switch to the OPERATE position.

f. Turn on power source to be monitored.

WARNING: Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) and/or any other requirements applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

CAUTION: To avoid damaging the equipment, do not apply AC voltages in excess of 600V RMS to any AC phase input (A,B, or C) of the 6003.

2.2.2 Circuit Applications

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

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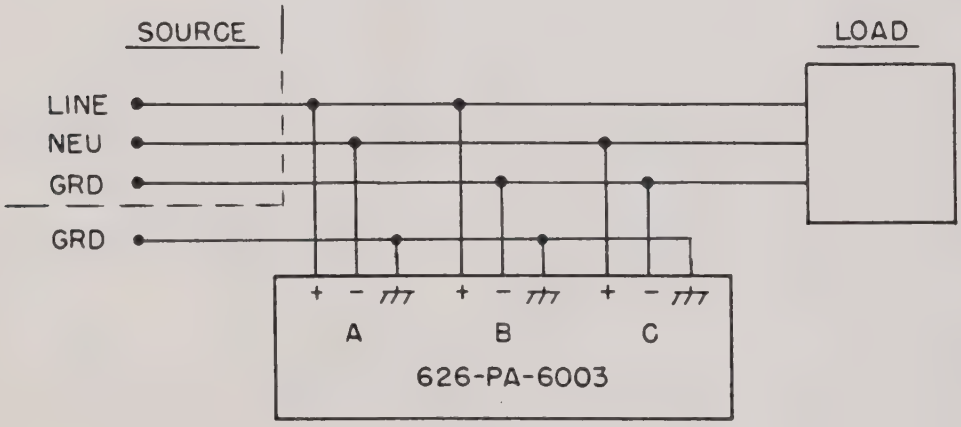
The 3-phase AC monitor for 45-65 Hz may be used for 3Ø Wye, 3Ø Delta, or for up to three separate AC signals. It may be used by itself to do Normal Mode/Common Mode analysis on 1 phase lines, or in combination with a 626-PA-6006 to do Normal Mode/Common Mode analysis on a 3 phase wye line.



1 Phase Normal Mode/Common Mode

Readings:

Channel A: LINE-Neutral
Channel B: LINE-Ground
Channel C: Neutral-Ground

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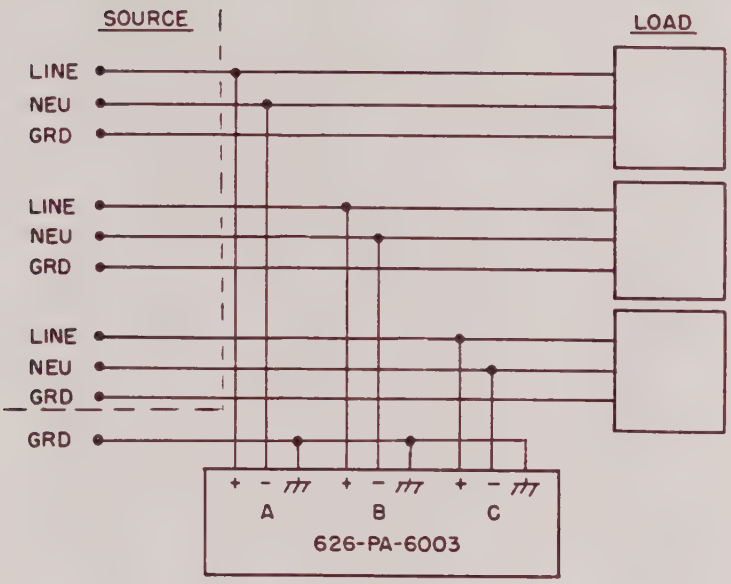
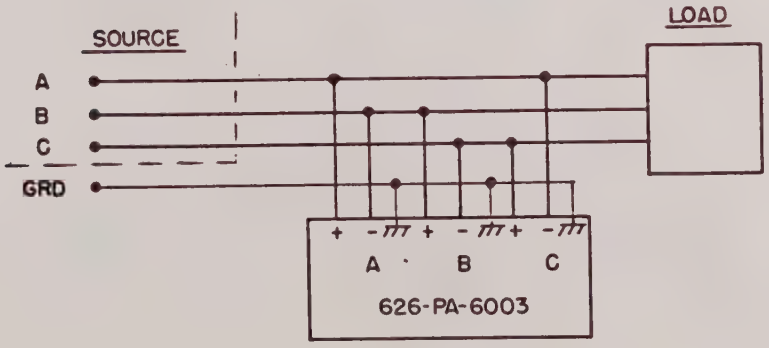


3 Separate AC Lines

Notes

1. All Channels are monitored independently.
2. All line frequencies must be the same.
3. All 3 channels will have same program set-up.



3 Phase Delta

Notes

1. Delta may be grounded or ungrounded
2. Set 626-PA-6003 to monitor line-to-line voltage
   e.g.: For 240 volt delta, set High and Low Limits to either side of 240 VAC.

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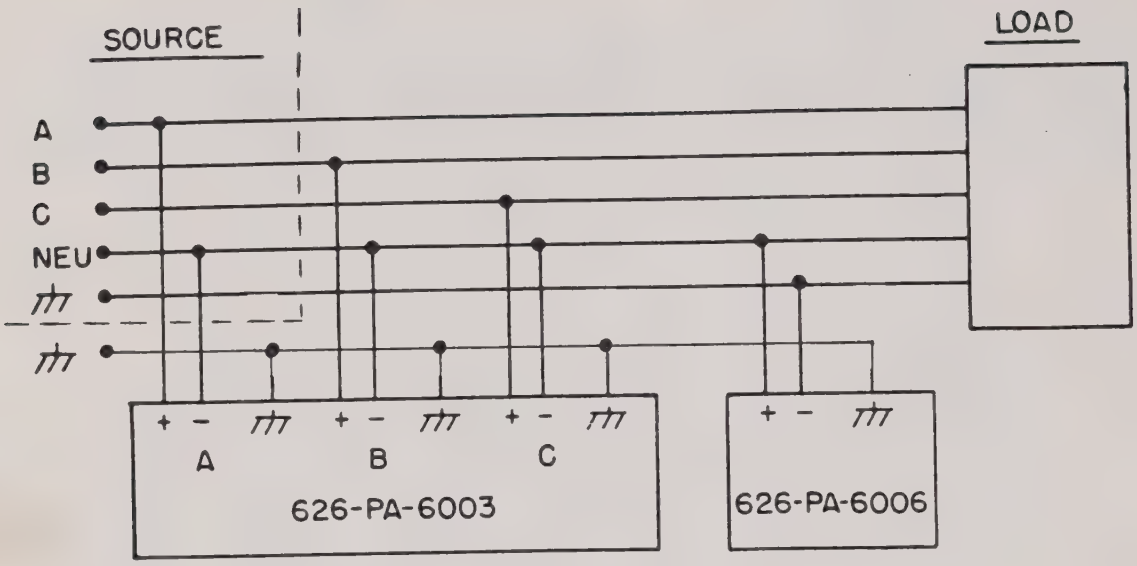

3 Phase Wye

Notes

1. 626-PA-6006 is added to perform Neutral-Ground (COMMON mode) monitoring.

2. Wye distribution is normally monitored Line-to-Neutral, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 120.

3. To monitor wye system line-to-line, set High and Low Limits to either side of higher stated voltage, and connect to 626-PA-6003 as though lines A, B, and C were from a delta, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 208.

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2.2.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious Impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of Impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade Potential Transformers for monitoring Impulses on high voltage power lines is not recommended. The limited frequency response of most Potential Transformers may result in substantial variation of Impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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2.3 OPERATING THE 6003

2.3.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6003 operation are described in Table 2-1. Figure 2-2 shows the Series 626 controls used by the 6003 module. For a description of controls common to overall Model 626 operation, refer to Volume 1 of the Mainframe manual.

2.3.2 Programming Procedure

Assume it is desired to program a high limit of 125V, a low limit of 105V, voltage sensitivity of 2 volts, frequency sensitivity of 0.2 Hz and an impulse sensitivity of 50V. Voltage and frequency sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 25 volts, a disturbance is recorded when impulse amplitude rises above 25 volts.

NOTE

1. It is recommended that the HI and LO limits be set to at least 3V (respectively) from the nominal voltage being measured. For example, if monitoring 120V, the high and low limits should be 117V (or less) and 123V (or more), respectively.

2. It is also recommended that the sensitivity be set to at least 2% of the nominal input voltage.

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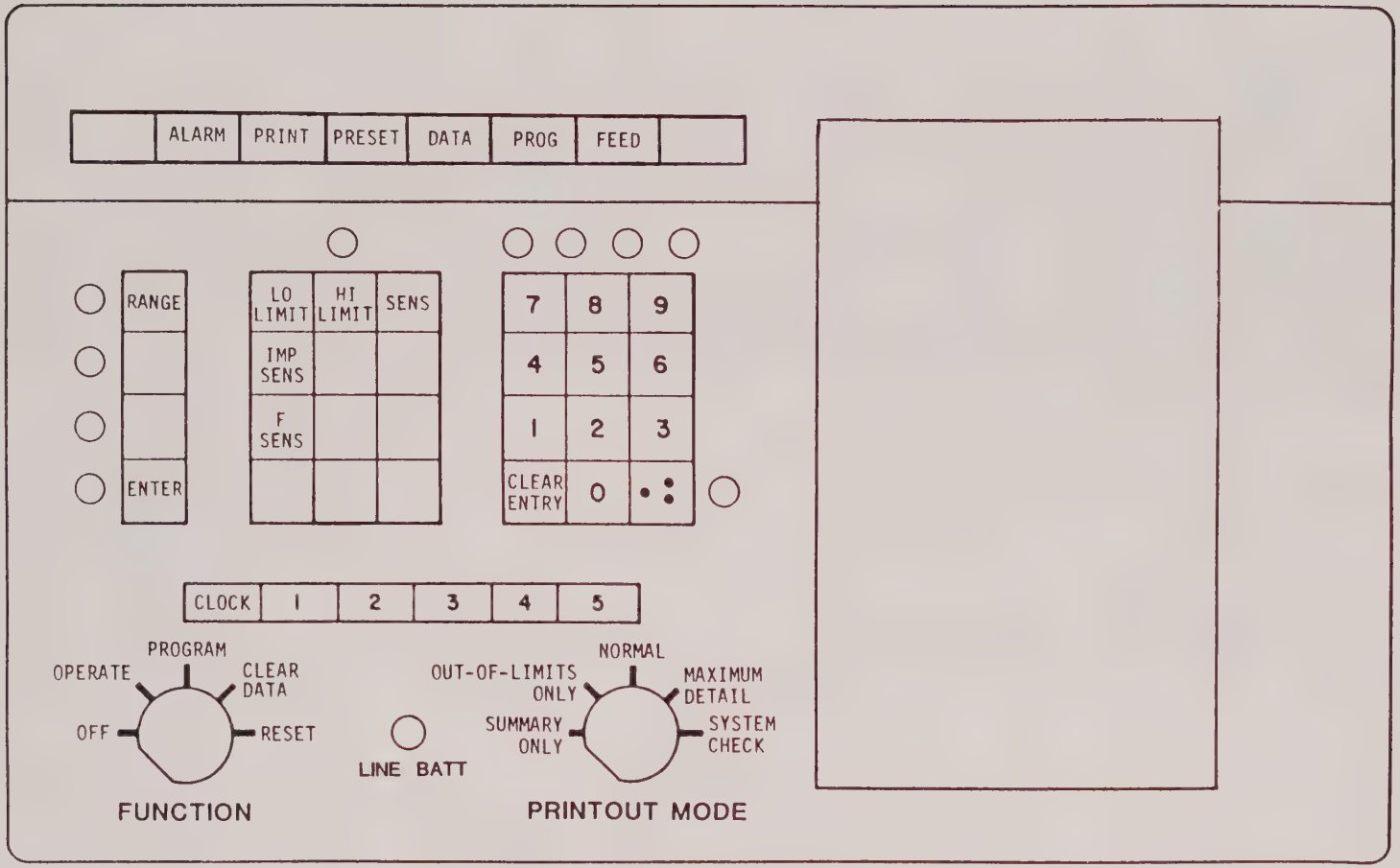

Figure 2-2. Series 626 Controls Used by the 6003 Plug-In

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Table 2-1. 6003 Operating Controls

Item	Function
LO LIMIT pushbutton 450V	When depressed, enables numeric keyboard to program low limit voltage.
HI LIMIT pushbutton 500V	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton 10V	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton 100V	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
F SENS pushbutton .5	When depressed, enables numeric keyboard to program frequency sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6003 memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel.

For the example cited, program the 6003 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that a cueing indicator above the center bank of pushbuttons lights. This indicates that a function may be programmed.

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d. Depress the HI LIMIT pushbutton. Program the high limit value (125), using the keyboard.

e. When the ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout and the ENTER indicator will go out.

f. Repeat steps c, d and e for the low limit voltage (105V) using the LO LIMIT pushbutton.

g. Repeat steps c, d and e for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 02.

h. Repeat steps c, d and e for the frequency sensitivity (0.2 Hz), using the F SENS pushbutton and programming the value as 0.2.

i. Repeat steps c, d and e for the impulse sensitivity (0050 volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

626		626A,G,R,ARA	
IMPULSE SENS	0050V	CH 4	
FREQ SENS	00.2 HZ	626-PA-6003	
VOLTAGE SENS	002 V	V HIGH LIMIT	125V
↑ V LOW LIMIT	105 V	V LOW LIMIT	105V
V HIGH LIMIT	125 V	VOLTAGE SENS	002 V
626-PA-6003		FREQ SENS	00.2 HZ ↓
CH 4		IMPULSE SENS	0050V

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits.

j. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

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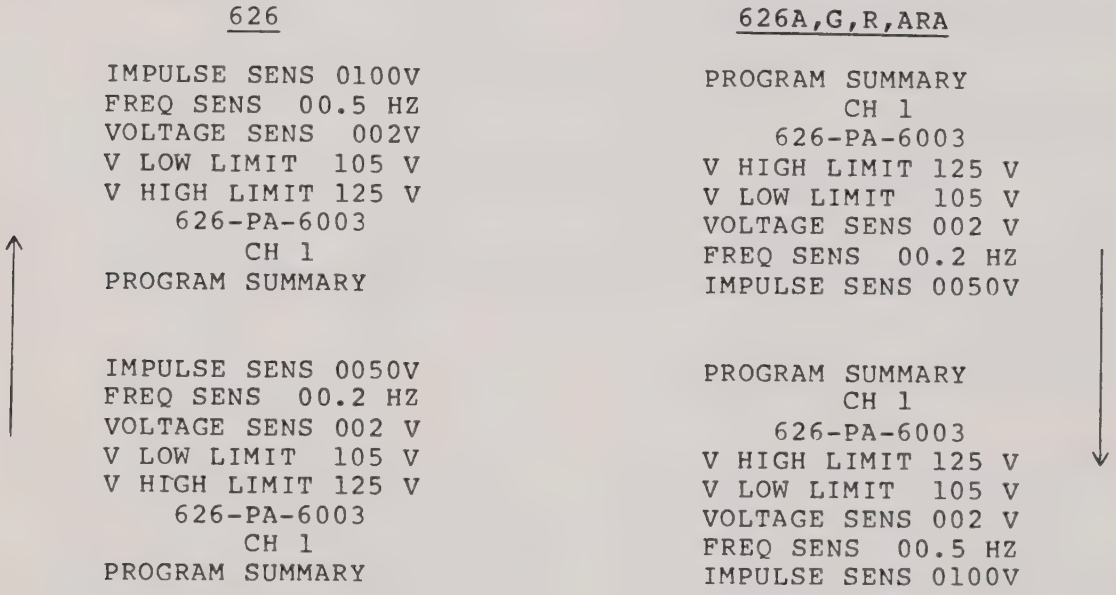
2.4 SELECTING THE FACTORY PRESET PROGRAM

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below. The printout group generated first is the operator program; the second is the factory program printed after the PRESET button is pressed.



626

```
IMPULSE SENS 0100V
FREQ SENS  00.5 HZ
VOLTAGE SENS  002V
V LOW LIMIT  105 V
V HIGH LIMIT 125 V
    626-PA-6003
        CH 1
PROGRAM SUMMARY


IMPULSE SENS 0050V
FREQ SENS  00.2 HZ
VOLTAGE SENS 002 V
V LOW LIMIT  105 V
V HIGH LIMIT 125 V
    626-PA-6003
        CH 1
PROGRAM SUMMARY
```

626A,G,R,ARA

```
PROGRAM SUMMARY
        CH 1
    626-PA-6003
V HIGH LIMIT 125 V
V LOW LIMIT  105 V
VOLTAGE SENS 002 V
FREQ SENS  00.2 HZ
IMPULSE SENS 0050V


PROGRAM SUMMARY
        CH 1
    626-PA-6003
V HIGH LIMIT 125 V
V LOW LIMIT  105 V
VOLTAGE SENS 002 V
FREQ SENS  00.5 HZ
IMPULSE SENS 0100V
```

2.5 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6003, it is recorded and displayed in characteristic manner.

2.5.1 Overvoltage

An overvoltage condition exists when the monitored power line voltage exceeds the user-specified upper limit for more than 2.55 seconds. An overvoltage condition is indicated by a printout such as the following:

```
4B  HI   09:46:07.11
```

where 4 is the channel number, B is the phase and time is given in hours, minutes and seconds (to .01 sec resolution).

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When the line voltage recovers to normal, a printout such as the following occurs:

626	626A,G,R,ARA
4B NOR Ø9:46:15.2Ø 148.6 V MAX	148.6 V MAX 4B NOR Ø9:46:15.2Ø

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

2.5.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. An undervoltage condition is indicated by a printout such as the following:

```
4C  LO   Ø9:46:15.2Ø
```

When the line voltage returns to normal level, a message such as the following is printed:

626	626A,G,R,ARA
4C NOR Ø9:46:18.45 36.4 V MIN	36.4 V MIN 4C NOR Ø9:46:18.45

indicating when normal voltlage was restored and the value of the lowest voltage reached during the undervoltage interval.

2.5.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected integer voltage between one and 15 volts for a 115-volt line. The following example shows several voltage change printouts. The first shows that Phase A voltage in channel 3 decreased to 1Ø9.2V at time shown. The second printout shows that phase C voltage increased to 115.4V at time shown.

626	626A,G,R,ARA
2C INC Ø1:Ø2:34.56 115.4 V 3A DEC Ø1:Ø2:34.56 1Ø9.2 V	115.4 V 2C INC Ø1:Ø2:34.56 1Ø9.2 V 3A DEC Ø1:Ø2:34.56

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2.5.4 Voltage Surge

A Voltage Surge is defined as a line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
4B   HI   09:45:33.15
```

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

	626	626A,G,R,ARA	
↑	4B NOR 09:45:33.38 128.2 V MAX SURGE 0.23 SEC	SURGE 0.23 SEC 128.2 V MAX 4B NOR 09:45:33.38	↓

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

2.5.5 Voltage Sag

A voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

NOTE

Voltage inputs less than 25V RMS will be printed out as 0.0V on the 6003.

2.5.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

	626	626A,G,R,ARA	
↑	2A IMP 10:12:13.45 +0139 V, 0010 US	+0139 V, 0010 US 2A IMP 10:12:13.45	↓

This printout indicates that an impulse which deviated from normal line voltage by +139 volts peak and whose duration was 10 microseconds was detected on phase A of Channel 2 at the time shown. The impulse magnitude is measured with respect to the instantaneous point on the power frequency sinewave at which it occurs. Impulse polarity is referenced to "+" and "-" markings on rear panel.

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2.5.7 Frequency Change

A frequency change printout is triggered when the line frequency changes more than a preselected amount from the last printed value. The frequency change sensitivity is a user-selected value between Ø.2 Hz and 3.Ø HZ in Ø.1 HZ increments. The following example shows several frequency change printouts.

526	626A,G,R,ARA
3 FRQ 1Ø:16:27.Ø2	Ø6Ø.5 HZ
Ø6Ø.5 HZ	3 FRQ 1Ø:16:27.Ø2
3 FRQ 1Ø:16:24.32	Ø6Ø.Ø HZ
Ø6Ø.Ø HZ	3 FRQ 1Ø:16:24.32
3 FRQ 1Ø:16:17.Ø2	Ø59.5. HZ
Ø59.5 HZ	3 FRQ 1Ø:16:17.Ø2

2.6 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise. The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in phase A of Channel 1 and that the limits for Channel 1 were programmed as follows:

V LOW LIMIT	1Ø5 Vrms
V HIGH LIMIT	125 Vrms
V SENSITIVITY	2 Vrms

The example printouts are referenced to figures 2-3 and 2-4 which illustrate overvoltage and voltage sag disturbances, respectively.

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

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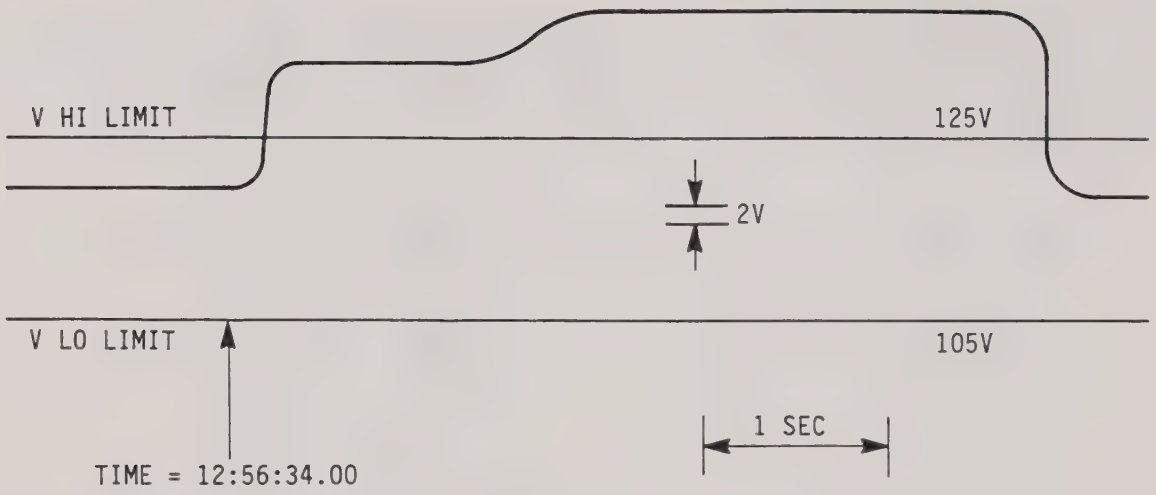

Figure 2-3. Overvoltage Disturbance (6003)

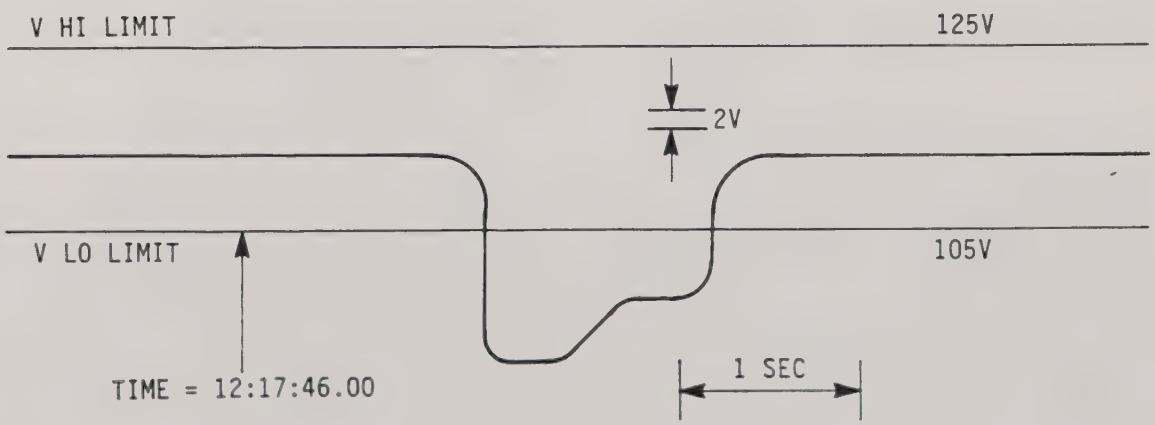

Figure 2-4. Voltage Sag Disturbance (6003)

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The first printout group generated below illustrates overvoltage (fig. 2-3) in the NORMAL mode. The second (3-line) group illustrates overvoltage in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:56:38.51
    139.1  V  MAX

1A  HI    12:56:34.21
```

```
1A  NOR   12:56:38.51
    139.1  V  Max

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3 V

1A  INC   12:56:35.62
    135.3 V

1A  INC   12:56:35.40
    133.3 V

1A  INC   12:56:34.22
    131.3 V

1A  INC   12:56:34.21
    129.2 V

1A  HI    12:56:34.21
```

626A,G,R,ARA

```
1A  HI    12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V   MAX
1A  NOR    12:56:38.51
```

```
1A  HI    12:56:34.21

    139.1  V   MAX
1A  NOR   12:56:38.51
```

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The following is a printout of overvoltage (fig. 2-3) in the MAXIMUM DETAIL mode.

626			626A		
1A	DEC	12:56:38.61		119.0	V
	119.8	V	1A	INC	12:50:12.34
1A	DEC	12:56:38.53		121.1	V
	121.8	V	1A	INC	12:56:34.20
1A	DEC	12:56:38.51	1A	HIGH	12:56:34.21
	124.0	V		129.2	V
1A	NORM	12::56:38.51	1A	INC	12:56:34.21
	139.1	V MAX		131.3	V
1A	DEC	12:56:38.50	1A	INC	12:56:34.22
	130.2	V		133.3	V
1A	INC	12:56:35.78	1A	INC	12:56:35:40
	137.3			135.3	V
1A	INC	12:56:35.62	1A	INC	12:56:35.62
	135.3	V		137.3	V
1A	INC	12:56:35.40	1A	INC	12:56:35.78
	133.3	V		130.2	V
1A	INC	12:56:34.22	1A	DEC	12:56:38.50
	131.3	V		139.1	V
1A	INC	12:56:34.21	1A	NORM	12:56:38.51
	129.2	V		124.0	V
1A	HIGH	12:56:34.21	1A	DEC	12:56:38.51
1A	INC	12:56:34.20		121.8	V
	121.1	V	1A	DEC	12:56:38.53
1A	INC	12:50:12.34		119.8	V
	119.0	V	1A	DEC	12:56:38.61

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The first group of generated printouts below illustrates voltage sag (fig. 2-4) in the NORMAL mode. The second group illustrates voltage sag in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:17:48.61
    Ø90.1  V  MIN
    SAG  1.25 SEC

1A  LOW   12:17:47.36


1A  NORM  12:17:48.61
    Ø90.1   V  MIN
    SAG   1.25 SEC

1A  INC   12:17:48.6Ø
    1Ø3.1  V

1A  INC  12:17:48.55
    Ø98.Ø  V

1A  INC   12:17:48.Ø5
    Ø96.Ø  V

1A  INC   12:17:47.96
    Ø94.Ø  V

1A  DEC   12:17:47.39
    Ø91.9  V

1A  DEC   12:17:47.37
    Ø94.1  V

1A  DEC   12:17:47.36
    1Ø1.3  V

1A  LOW   12:17:47.36
```

626A,G,R,ARA

```
1A  LOW    12:17:47.36

    1Ø1.3   V
1A  DEC    12:17:47.36

    Ø94.1   V
1A  DEC    12:17:47.37

    Ø91.9   V
1A  DEC    12:17:47.39

    Ø94.Ø   V
1A  INC    12:17:47.96

    Ø96.Ø   V
1A  INC    12:17:48.Ø5

    Ø98.Ø   V
1A  INC    12:17:48.55

    1Ø3.1   V
1A  INC    12:17:48.6Ø

    SAG   1.25 SEC
    Ø9Ø.1   V  MIN
1A  NORM   12:17:48.61


1A   LOW   12:17:47.36

     SAG  1.25 SEC
     Ø9Ø.1  V   MIN
1A   NOR   12:17:48.61
```

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The following printout illustrates voltage sag (fig. 2-4) in the MAXIMUM DETAIL mode.

626

```
1A  DEC   12:27:48.86
    112.1  V

1A  INC   12:17:48.69
    110.0  V

1A  INC   12:17:48.62
    108.1  V

1A  INC   12:17:48.61
    105.9

1A  NORM  12:17:48.61
    090.1   V  MIN
    SAG   1.25  SEC

1A  INC   12:17:48.60
    103.1  V

1   INC   12:17:48.55
    098.0  V

1A  INC   12:17:48.05
    096.0  V

1A  INC   12:17:47.96
    094.0  V

1A  DEC   12:17:47.39
    091.9  V

1A  DEC   12:17:47.37
    094.1  V

1A  DEC   12:17:47.36
    101.3  V

1A  LOW   12:17:47.36

1A  DEC   12:17:47.35
    110.8  V

1A  INC   12:16:32.15
    113.0  V
```

626A,G,R,ARA

```
    113.0  V
1A  INC   12:16:32.15

    110.8  V
1A  DEC   12:17:47.35

1A  LOW   12:17:47.36

    101.3  V
1A  DEC   12:17:47.36

    094.1  V
1A  DEC   12:17:47.37

    091.9  V
1A  DEC   12:17:47.39

    094.0  V
1   INC   12:17:47.96

    096.0  V
1A  INC   12:17:48.05

    098.0  V
1A  INC   12:17:48.55

    103.1  V
1A  INC   12:17:48.60

    SAG   1.25  SEC
    090.1   V  MIN
1A  NORM  12:17:48.61

    105.9  V
1A  INC   12:17:48.61

    108.1  V
1A  INC   12:17:48.62

    110.0  V
1   INC   12:17:48.69

    112.1  V
1   INC   12:27:48.86
```


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SECTION III
OPERATIONAL TEST

3.1 GENERAL

This section provides information for performing an operational test to verify that the 6003 plug-in is operating properly.

3.2 SYSTEM CHECK

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6003. Any inputs connected at this time will be automatically disconnected during the system check period. Successful measurement of these signals verifies that the module is fully operational. Expected system check measurement results and allowable tolerances are listed below.

AC Voltage	196.0-204.0 Volts
Impulse Peak	2700-3300 Volts
Impulse Duration	360-440 uSec
Frequency	59.8-60.2 Hz

3.3 SAMPLE SYSTEM CHECK PRINTOUT

A typical system check printout obtained from a 6006 plug-in is illustrated below.

626

```
******************


IMP- 3008V, 0396US
AC VOLTS    199.4V
      PH C
IMP- 3064V, 0395US
AC VOLTS    199.5V
      PH B
IMP- 3103V, 0397US
AC VOLTS    199.8V
      PH A
FRQ    060.0 HZ
   626-PA-6003
      CH 4

TIME = 00:00:12.10
***SYSTEM CHECK***
```

626A,G,R,ARA

```
***SYSTEM CHECK***
TIME = 00:00:12.10

      CH 4
   626-PA-6003
FRQ    060.0 HZ
      PH A
AC VOLTS    199.8V
IMP- 3103V, 0397US
      PH B
AC VOLTS    199.5V
IMP- 3064V, 0395US
      PH C
AC VOLTS    199.4V
IMP- 3008V, 0396US


******************
```

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1001405

WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110235U-1

VOLUME 1

OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

NOTE: Refer to Volume 2 (Service Manual) of TM-110235U for maintenance data

1 May 1984
(Rev. 1 July 1984)
(Rev. 1 Sept. 1985)
(Rev. 1 May 1986)
(Rev. 15 May 1987)
(Rev. 1 Sept. 1989)
(Rev.B)

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IMPORTANT! CALIBRATION INTERVAL

The recommended calibration interval for this unit is once every 12 MONTHS.

We recommend that you return the unit to the factory for calibration. If you decide to do so, first contact the Dranetz Customer Service Department to obtain an authorization number.

Telephone Number:	(201) 287-3680
Telex Number:	499-7808
TWX Number:	(710) 997-9553
FAX Number:	(201) 248-9240
Cable:	DRANETZ

Then fill out the Repair/Service Order form enclosed in this manual and ship it along with the unit to the Dranetz Customer Service Department. (If this form is missing, ask the Dranetz Customer Service Department for a replacement.)

STATEMENT OF WARRANTY

ALL PRODUCTS OF DRANETZ TECHNOLOGIES, INC. ARE WARRANTED TO THE ORIGINAL PURCHASER AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. DRANETZ WILL REPAIR OR REPLACE, AT ITS OPTION, ALL DEFECTIVE EQUIPMENT RETURNED, FREIGHT PREPAID, DURING THE WARRANTY PERIOD, WITHOUT CHARGE FOR REPAIR, PROVIDED THERE IS NO EVIDENCE THAT THE EQUIPMENT HAS BEEN MISHANDLED OR ABUSED. THIS WARRANTY SHALL NOT APPLY TO ANY DEFECTS RESULTING FROM IMPROPER OR INADEQUATE MAINTENANCE, BUYER-SUPPLIED HARDWARE/SOFTWARE OR INTERFACING, UNAUTHORIZED MODIFICATION OR MISUSE OF THE EQUIPMENT, OPERATION OUTSIDE OF THE ENVIRONMENTAL SPECIFICATIONS FOR THE PRODUCT, OR IMPROPER SITE PREPARATION OR MAINTENANCE.

The information in this manual has been reviewed and is believed to be entirely reliable. No responsibility, however, is assumed for any inaccuracies. The material in this manual is for information purposes only, and is subject to change without notice.

VOLUME 1
OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

SECTION 1
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual, consists of three sections: I) GENERAL INFORMATION, II) INSTALLATION AND OPERATION, and III) OPERATIONAL CHECK. Volume 2, the Service manual, contains the maintenance instructions.

1.2 INTRODUCTION

This manual provides operating instructions for the 626-PA-6003 Plug-in, hereinafter referred to as the 6003, used in the Series 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in Volume 1 of the Mainframe manual.

1.3 PURPOSE

The 6003 monitors disturbances on 3-phase AC power lines with either 50 or 60 Hz nominal frequency. Each phase is monitored on a single voltage range of 0 to 600 V RMS. With thresholds programmed by the user, the 6003 monitors both short and long term power line disturbances. With this plug-in, the unit stores, analyzes, classifies and prints out quantative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The plug-in monitors any 3-phase power line whose RMS values range from a low value of 0 volts to as high as 600 volts. Three types of disturbances are monitored by the 6003: power line frequency, power frequency transients and waveform disturbances. Power frequency transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses", include all conditions that cause the power line waveform to deviate from an ideal waveform. The 6003 measures the peak amplitude of impulses, their polarity and duration. The threshold value of each type of disturbance, as well as the line frequency, above which detection and printout occurs is operator programmable. (All threshold settings are common to all three line phases.) Except for an automatic summary printout at the end of day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of the day. This feature permits long term unattended operation.

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The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

NOTE: Frequency measurements are derived from phase A only. Therefore, if single-phase monitoring is desired, phase A should be used.

1.4 APPLICATIONS

When installed in the 626 mainframe, the 6003 provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the instrument permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

b. To perform pre-installation site surveys. The 6003 can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable instrument, particularly well suited for field use, is ideal for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the instrument provides a clear record of the quality of power supplied during unattended periods.

1.5 EQUIPMENT CHARACTERISTICS

The 6003 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in one of four slots of the Series 626 Universal Disturbance Analyzer. Technical specifications of the 6003 are presented in Table 1-1.

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Table 1-1. 626-PA-6003 Technical Specifications

Input	2 wire differential Z_{in} = 40 Megohms plus 40 pf (each side to ground)
Input Voltage Range	50-600V RMS
Lower Limit of User-Set Voltage (V_{LOW})	50V to 599V
Upper Limit of User-Set voltage (V_{HIGH})	600V to 51V
Voltage Change Sensitivity (V_{SENS}) (1V Increments)	2 to 60V
Line Voltage Measurement Resolution	0.2V
Line Voltage Measurement Accuracy	±1% of reading, ±0.2% of full scale (75V to 600V)
Line Frequency	
Range	45-65 Hz
Resolution	±0.1 Hz
Accuracy	±0.1 Hz
Impulse Range	50-4000V Pk (1-2000 uSec)
Impulse Peak Resolution	1V
Impulse Accuracy	±10% of reading ±1% F.S. (5 uSec-50 uSec.) (decreasing to ±6 dB from 1 uSec to 2 mSec) 100V-4000V
Impulse Duration Range	1 uSec to 2 mSec
Impulse Duration Resolution	1 uSec

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1.6 STANDARD ACCESSORIES

Model No.	Part No.	Quan.	Description
626PA6003-1 (Barrier, Block Connections)	TM110235U (Vol. 1)	1	Operating Manual
626PA6003-2 (Plug-type Connections)	TM110235U (Vol. 1)	1	Operating Manual
	110480-G1	3	A.C. Cables

1.7 OPTIONAL ACCESSORIES

Part No.	Quan.	Description
TM-110235U (Vol. 2)	1	Service (Maintenance Manual)

1.8 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Customer Service Department in order to obtain an Authorization Number.

   Telephone No: (201) 287-3680

   TWX: (710) 997-9553

   FAX: (201) 248-9240

   Telex: 499-7808

   Cable: DRANETZ

2. Fill out the REPAIR/SERVICE ORDER enclosed in this manual and ship it with the malfunctioning equipment to the Dranetz Customer Service Department.

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SECTION II
INSTALLATION AND OPERATION

2.1 INSTALLATION

2.1.1 Selection of Nominal Operation Frequency

Factory set switches in the 6003 optimize the measurements for a nominal frequency of either 50 or 60 Hz. Figure 2-1 locates these switches on the Analog board of the module. Dots on switches on the figure indicate which side of the switch is to be depressed for 60 Hz. For 50 Hz operation, simply reverse all switch positions.

2.1.2 Installation of 6003 in Mainframe

CAUTION: Be sure that all power is removed from the 626 and modules.

a. With the rear panel markings reading correctly, carefully slide the module into the desired slot, with the Digital board within the card-guide tracks until it is firmly seated.

b. Tighten the top and bottom captive screws to secure the module into the mainframe.

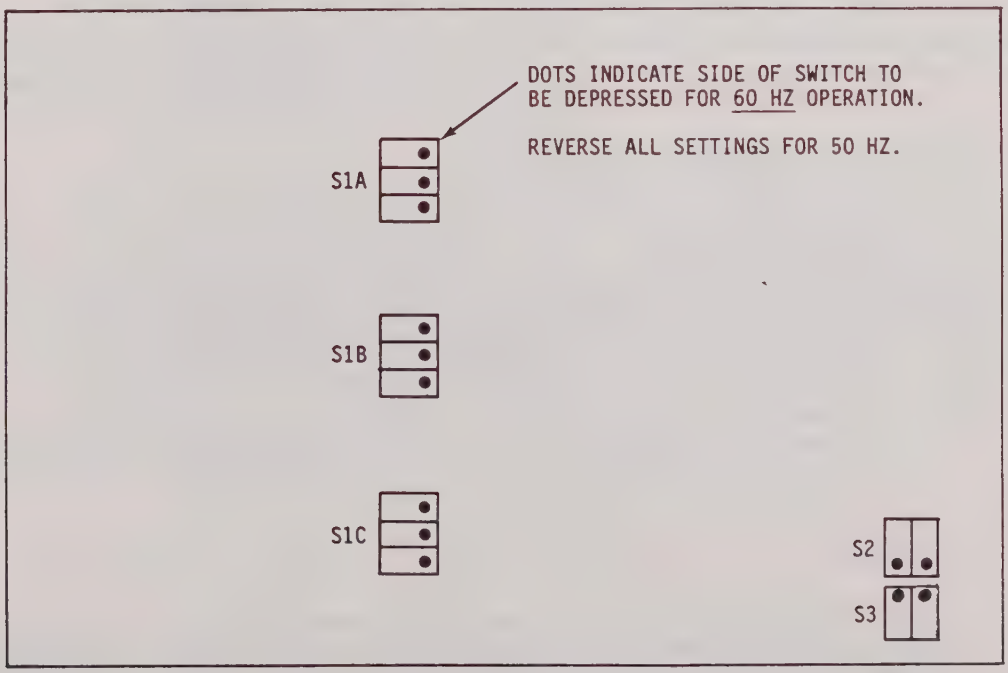

Figure 2-1. Analog Board Switch Locations

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2.1.3 LOAD RATINGS

The Series 626 standard mainframe has an upper limit of the combined total rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating	Plug-in	Load Rating
626-PA-6001	2 Units	626-PA-60012A	3 Units
626-PA-6001 with Extra Option Board	3 Units	626-PA-6013	2 Units
		626-PA-6014	1 Unit
		626-PA-6015	4 Units
626-PA-6002	2 Units	626-PA-6018	4 Units
626-PA-6003	4 Units	626-PA-6020	4 Units
626-PA-6005	2 Units	626-PA-6024A	4 Units
626-PA-6006	2 Units	626-PA-6024B	4 Units
626-PA-6007	1 Unit	626-PA-6025	4 Units
626-PA-6008	2 Units	626-PA-6030	6 Units
626-PA-6009	4 Units	626-PA-6037	1 Unit
626-PA-6011	1 Unit	626-PA-6038	1 Unit
626-PA-6012	2 Units	626-PA-6040	6 Units

NOTE

When selecting modules for installation in any mainframe, verify that the sum of the load ratings of the installed modules DOES NOT exceed 20.

2.2 CONNECTING POWER SOURCE TO MODULE

2.2.1 Connection Procedure

The 6003 is equipped with either three rear panel AC connectors, or a barrier block. Inputs include phase A, B, and C. Connectors must be wired in accordance with the rear panel connector markings (AC high, AC low, and earth ground from top to bottom).

a. Turn the 626 off by inserting the key in FUNCTION key switch on front panel of mainframe and setting the switch to the OFF position.

b. Turn off power source that is to be monitored by the module.

c. Make all connections to the 6003 module first. If the 6003 has been supplied with connectors, merely insert the mating connector, supplied with the unit, until a "click" is heard.

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If the 6003 has been supplied with a barrier block, make all connections to the barrier block first, then be sure to replace the barrier block cover. DO NOT PROCEED UNTIL PARAGRAPH C IS COMPLETE.

d. Make the desired connections to the power source to be monitored.

e. Power up the 626 by turning the FUNCTION key switch to the OPERATE position.

f. Turn on power source to be monitored.

WARNING: Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) and/or any other requirements applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

CAUTION: To avoid damaging the equipment, do not apply AC voltages in excess of 600V RMS to any AC phase input (A,B, or C) of the 6003.

2.2.2 Circuit Applications

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

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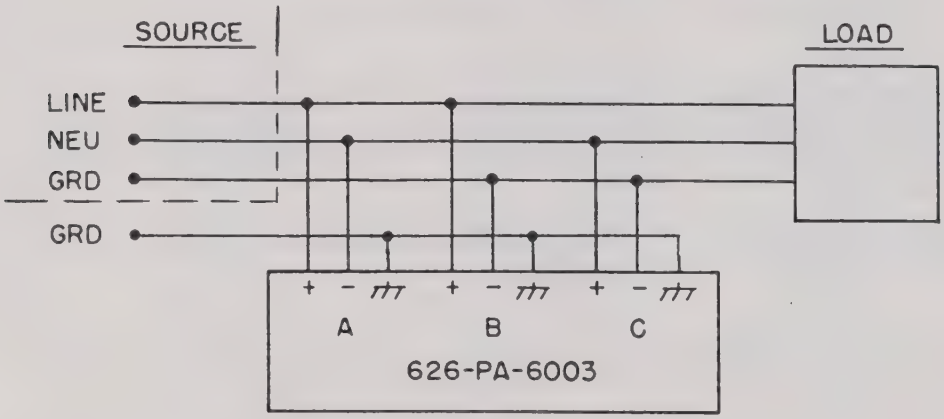
The 3-phase AC monitor for 45-65 Hz may be used for 30 Wye, 30 Delta, or for up to three separate AC signals. It may be used by itself to do Normal Mode/Common Mode analysis on 1 phase lines, or in combination with a 626-PA-6006 to do Normal Mode/Common Mode analysis on a 3 phase wye line.



1 Phase Normal Mode/Common Mode

Readings:

Channel A: LINE-Neutral
Channel B: LINE-Ground
Channel C: Neutral-Ground

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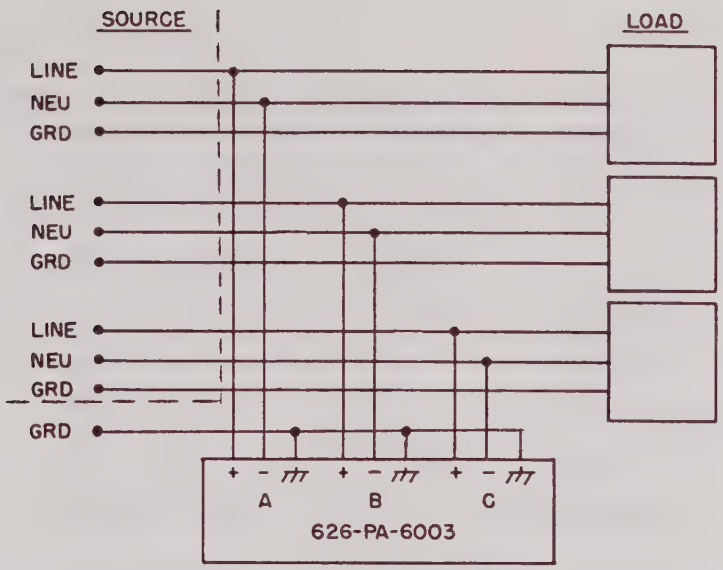
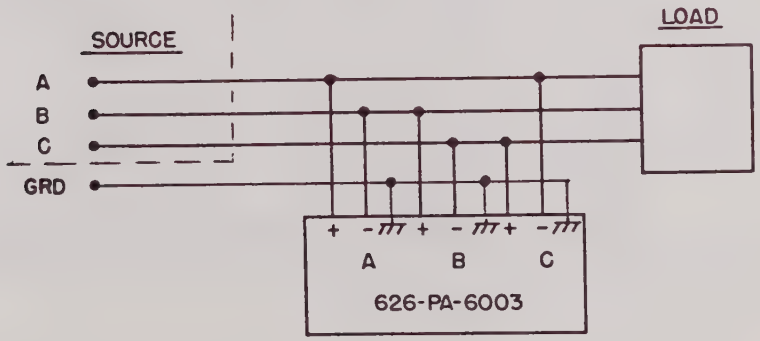


3 Separate AC Lines

Notes

1. All Channels are monitored independently.
2. All line frequencies must be the same.
3. All 3 channels will have same program set-up.



3 Phase Delta

Notes

1. Delta may be grounded or ungrounded
2. Set 626-PA-6003 to monitor line-to-line voltage e.g.: For 240 volt delta, set High and Low Limits to either side of 240 VAC.

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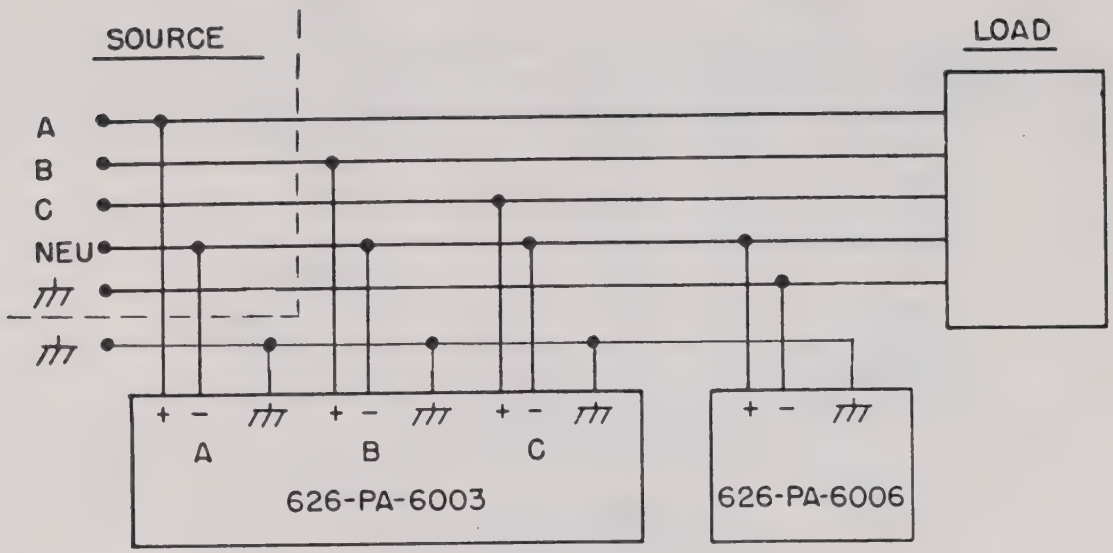

3 Phase Wye

Notes

1. 626-PA-6006 is added to perform Neutral-Ground (COMMON mode) monitoring.

2. Wye distribution is normally monitored Line-to-Neutral, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 120.

3. To monitor wye system line-to-line, set High and Low Limits to either side of higher stated voltage, and connect to 626-PA-6003 as though lines A, B, and C were from a delta, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 208.

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2.2.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious Impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of Impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade Potential Transformers for monitoring Impulses on high voltage power lines is not recommended. The limited frequency response of most Potential Transformers may result in substantial variation of Impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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2.3 OPERATING THE 6ØØ3

2.3.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6ØØ3 operation are described in Table 2-1. Figure 2-2 shows the Series 626 controls used by the 6ØØ3 module. For a description of controls common to overall Model 626 operation, refer to Volume 1 of the Mainframe manual.

2.3.2 Programming Procedure

Assume it is desired to program a high limit of 125V, a low limit of 1Ø5V, voltage sensitivity of 2 volts, frequency sensitivity of Ø.2 Hz and an impulse sensitivity of 5ØV. Voltage and frequency sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 25 volts, a disturbance is recorded when impulse amplitude rises above 25 volts.

NOTE

1. It is recommended that the HI and LO limits be set to at least 3V (respectively) from the nominal voltage being measured. For example, if monitoring 12ØV, the high and low limits should be 117V (or less) and 123V (or more), respectively.

2. It is also recommended that the sensitivity be set to at least 2% of the nominal input voltage.

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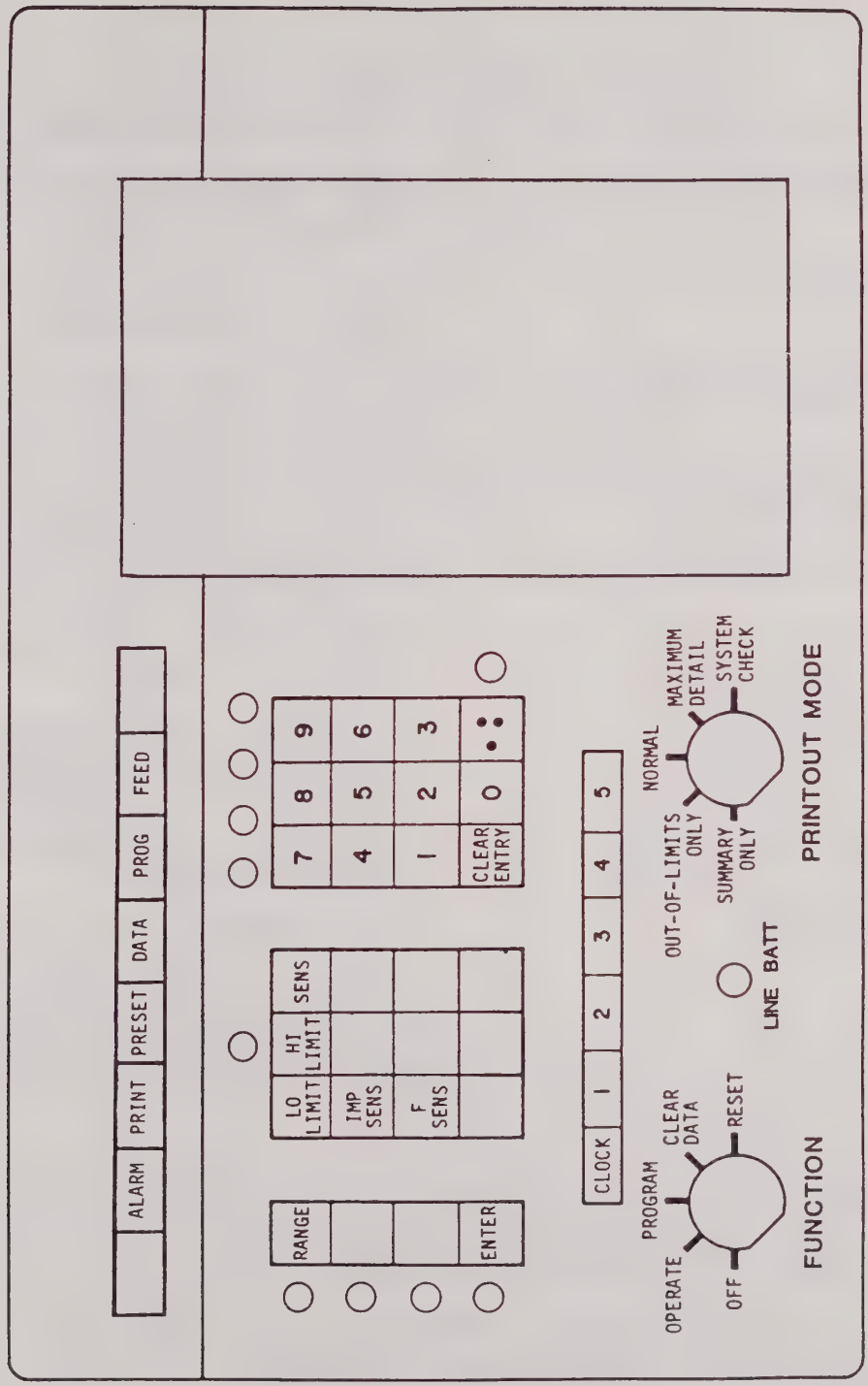

Figure 2-2. Series 626 Controls Used by the 6003 Plug-In

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Table 2-1. 6003 Operating Controls

Item	Function
LO LIMIT pushbutton	When depressed, enables numeric keyboard to program low limit voltage.
HI LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
F SENS pushbutton	When depressed, enables numeric keyboard to program frequency sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6003 memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel.

For the example cited, program the 6003 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that a cueing indicator above the center bank of pushbuttons lights. This indicates that a function may be programmed.

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d. Depress the HI LIMIT pushbutton. Program the high limit value (125), using the keyboard.

e. When the ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout and the ENTER indicator will go out.

f. Repeat steps c, d and e for the low limit voltage (105V) using the LO LIMIT pushbutton.

g. Repeat steps c, d and e for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 02.

h. Repeat steps c, d and e for the frequency sensitivity (0.2 Hz), using the F SENS pushbutton and programming the value as 0.2.

i. Repeat steps c, d and e for the impulse sensitivity (0050 volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

626		626A,G,R,ARA	
IMPULSE SENS	0050V	CH 4	
FREQ SENS	00.2 HZ	626-PA-6003	
VOLTAGE SENS	002 V	V HIGH LIMIT	125V
↑ V LOW LIMIT	105 V	V LOW LIMIT	105V
V HIGH LIMIT	125 V	VOLTAGE SENS	002 V
626-PA-6003		FREQ SENS	00.2 HZ ↓
CH 4		IMPULSE SENS	0050V

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits.

j. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

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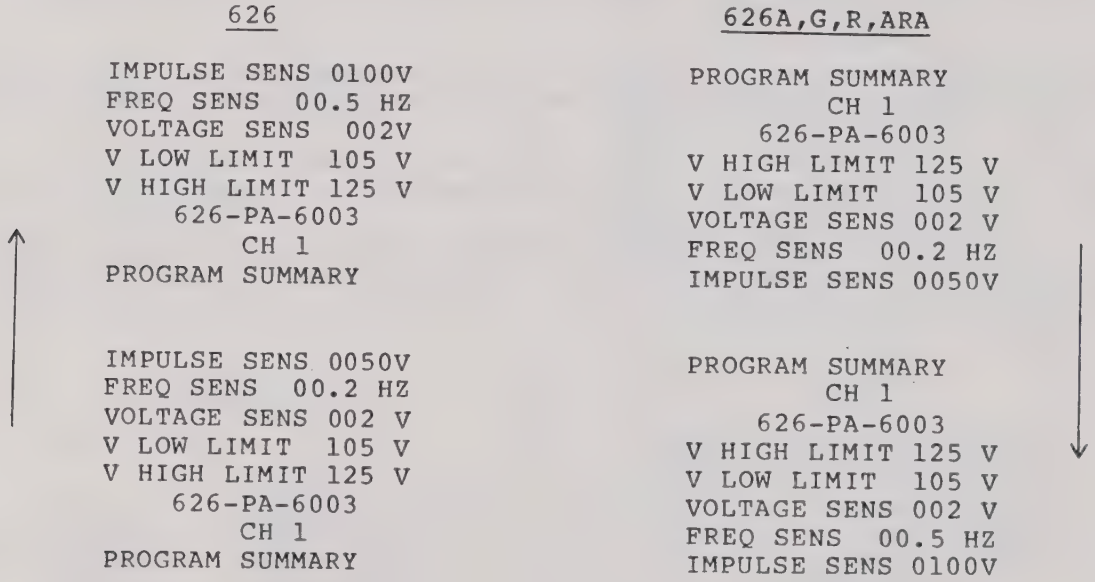
2.4 SELECTING THE FACTORY PRESET PROGRAM

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below. The printout group generated first is the operator program; the second is the factory program printed after the PRESET button is pressed.



2.5 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6003, it is recorded and displayed in characteristic manner.

2.5.1 Overvoltage

An overvoltage condition exists when the monitored power line voltage exceeds the user-specified upper limit for more than 2.55 seconds. An overvoltage condition is indicated by a printout such as the following:

4B HI 09:46:07.11

where 4 is the channel number, B is the phase and time is given in hours, minutes and seconds (to .01 sec resolution).

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When the line voltage recovers to normal, a printout such as the following occurs:

626	626A,G,R,ARA
4B NOR Ø9:46:15.2Ø	148.6 V MAX
148.6 V MAX	4B NOR Ø9:46:15.2Ø

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

2.5.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. An undervoltage condition is indicated by a printout such as the following:

```
4C  LO   Ø9:46:15.2Ø
```

When the line voltage returns to normal level, a message such as the following is printed:

626	626A,G,R,ARA
4C NOR Ø9:46:18.45	36.4 V MIN
36.4 V MIN	4C NOR Ø9:46:18.45

indicating when normal voltlage was restored and the value of the lowest voltage reached during the undervoltage interval.

2.5.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected integer voltage between one and 15 volts for a 115-volt line. The following example shows several voltage change printouts. The first shows that Phase A voltage in channel 3 decreased to 1Ø9.2V at time shown. The second printout shows that phase C voltage increased to 115.4V at time shown.

626	626A,G,R,ARA
2C INC Ø1:Ø2:34.56	115.4 V
115.4 V	2C INC Ø1:Ø2:34.56
3A DEC Ø1:Ø2:34.56	1Ø9.2 V
1Ø9.2 V	3A DEC Ø1:Ø2:34.56

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2.5.4 Voltage Surge

A Voltage Surge is defined as a line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
4B   HI   09:45:33.15
```

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

626	626A,G,R,ARA
↑ 4B NOR 09:45:33.38	SURGE 0.23 SEC
128.2 V MAX	128.2 V MAX ↓
SURGE 0.23 SEC	4B NOR 09:45:33.38

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

2.5.5 Voltage Sag

A voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

NOTE

Voltage inputs less than 25V RMS will be printed out as 0.0V on the 6003.

2.5.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

626	626A,G,R,ARA
↑ 2A IMP 10:12:13.45	+0139 V, 0010 US
+0139 V, 0010 US	2A IMP 10:12:13.45 ↓

This printout indicates that an impulse which deviated from normal line voltage by +139 volts peak and whose duration was 10 microseconds was detected on phase A of Channel 2 at the time shown. The impulse magnitude is measured with respect to the instantaneous point on the power frequency sinewave at which it occurs. Impulse polarity is referenced to "+" and "-" markings on rear panel.

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2.5.7 Frequency Change

A frequency change printout is triggered when the line frequency changes more than a preselected amount from the last printed value. The frequency change sensitivity is a user-selected value between Ø.2 Hz and 3.Ø HZ in Ø.1 HZ increments. The following example shows several frequency change printouts.

626	626A,G,R,ARA
3 FRQ 1Ø:16:27.Ø2	Ø6Ø.5 HZ
Ø6Ø.5 HZ	3 FRQ 1Ø:16:27.Ø2
3 FRQ 1Ø:16:24.32	Ø6Ø.Ø HZ
Ø6Ø.Ø HZ	3 FRQ 1Ø:16:24.32
3 FRQ 1Ø:16:17.Ø2	Ø59.5. HZ
Ø59.5 HZ	3 FRQ 1Ø:16:17.Ø2

2.6 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise. The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in phase A of Channel 1 and that the limits for Channel 1 were programmed as follows:

V LOW LIMIT	1Ø5 Vrms
V HIGH LIMIT	125 Vrms
V SENSITIVITY	2 Vrms

The example printouts are referenced to figures 2-3 and 2-4 which illustrate overvoltage and voltage sag disturbances, respectively.

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

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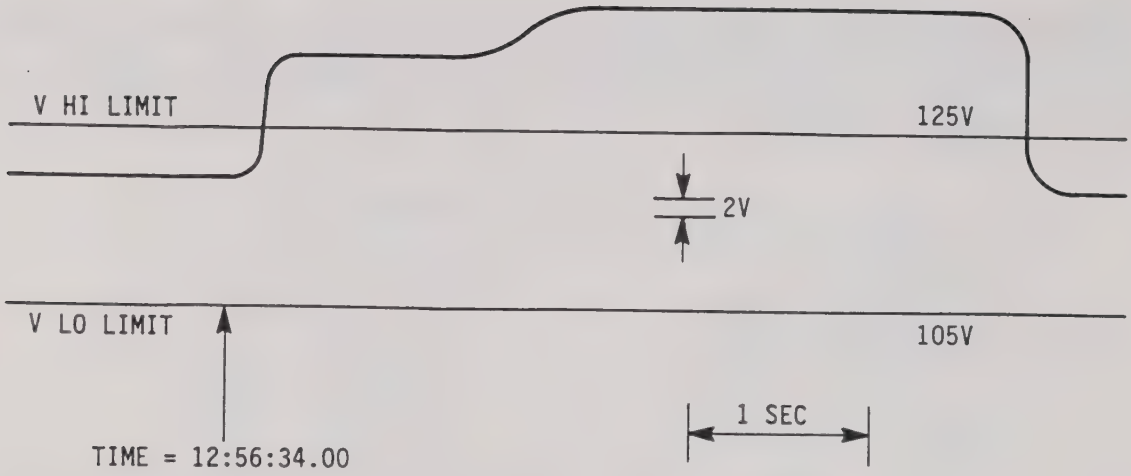

Figure 2-3. Overvoltage Disturbance (6003)

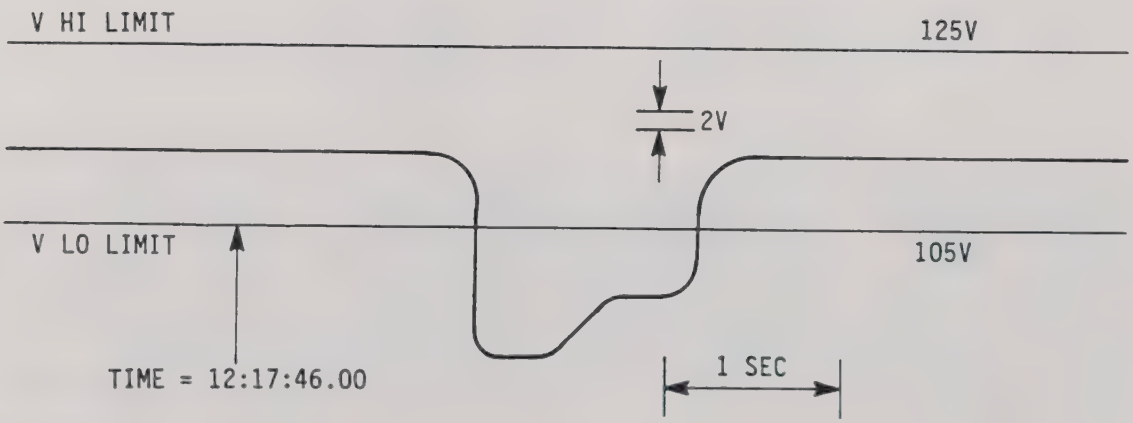

Figure 2-4. Voltage Sag Disturbance (6003)

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The first printout group generated below illustrates overvoltage (fig. 2-3) in the NORMAL mode. The second (3-line) group illustrates overvoltage in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:56:38.51
    139.1  V  MAX

1A  HI    12:56:34.21
```

626A,G,R,ARA

```
1A  HI    12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V   MAX
1A  NOR   12:56:38.51
```

```
1A  NOR   12:56:38.51
    139.1  V  Max

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3 V

1A  INC   12:56:35.62
    135.3 V

1A  INC   12:56:35.40
    133.3 V

1A  INC   12:56:34.22
    131.3 V

1A  INC   12:56:34.21
    129.2 V

1A  HI    12:56:34.21
```

```
1A  HI    12:56:34.21

    139.1  V   MAX
1A  NOR   12:56:38.51
```

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The following is a printout of overvoltage (fig. 2-3) in the MAXIMUM DETAIL mode.

626			626A		
1A	DEC	12:56:38.61		119.0 V	
	119.8 V		1A	INC	12:50:12.34
1A	DEC	12:56:38.53		121.1 V	
	121.8 V		1A	INC	12:56:34.20
1A	DEC	12:56:38.51	1A	HIGH	12:56:34.21
	124.0 V			129.2 V	
1A	NORM	12::56:38.51	1A	INC	12:56:34.21
	139.1 V MAX			131.3 V	
1A	DEC	12:56:38.50	1A	INC	12:56:34.22
	130.2 V			133.3 V	
1A	INC	12:56:35.78	1A	INC	12:56:35:40
	137.3			135.3 V	
1A	INC	12:56:35.62	1A	INC	12:56:35.62
	135.3 V			137.3 V	
1A	INC	12:56:35.40	1A	INC	12:56:35.78
	133.3 V			130.2 V	
1A	INC	12:56:34.22	1A	DEC	12:56:38.50
	131.3 V			139.1 V	
1A	INC	12:56:34.21	1A	NORM	12:56:38.51
	129.2 V			124.0 V	
1A	HIGH	12:56:34.21	1A	DEC	12:56:38.51
1A	INC	12:56:34.20		121.8 V	
	121.1 V		1A	DEC	12:56:38.53
1A	INC	12:50:12.34		119.8 V	
	119.0 V		1A	DEC	12:56:38.61

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The first group of generated printouts below illustrates voltage sag (fig. 2-4) in the NORMAL mode. The second group illustrates voltage sag in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:17:48.61
    090.1  V  MIN
    SAG  1.25 SEC

1A  LOW   12:17:47.36


1A  NORM  12:17:48.61
    090.1   V  MIN
    SAG   1.25 SEC

1A  INC   12:17:48.60
    103.1  V

1A  INC  12:17:48.55
    098.0  V

1A  INC   12:17:48.05
    096.0  V

1A  INC   12:17:47.96
    094.0  V

1A  DEC   12:17:47.39
    091.9  V

1A  DEC   12:17:47.37
    094.1  V

1A  DEC   12:17:47.36
    101.3  V

1A  LOW   12:17:47.36
```

626A,G,R,ARA

```
1A  LOW    12:17:47.36

    101.3   V
1A  DEC    12:17:47.36

    094.1   V
1A  DEC    12:17:47.37

    091.9   V
1A  DEC    12:17:47.39

    094.0   V
1A  INC    12:17:47.96

    096.0   V
1A  INC    12:17:48.05

    098.0   V
1A  INC    12:17:48.55

    103.1   V
1A  INC    12:17:48.60

    SAG   1.25 SEC
    090.1   V  MIN
1A  NORM   12:17:48.61


1A   LOW   12:17:47.36

     SAG  1.25 SEC
     090.1  V   MIN
1A   NOR   12:17:48.61
```

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The following printout illustrates voltage sag (fig. 2-4) in the MAXIMUM DETAIL mode.

626

```
1A  DEC    12:27:48.86
       112.1  V

1A  INC    12:17:48.69
       110.0  V

1A  INC    12:17:48.62
       108.1  V

1A  INC    12:17:48.61
       105.9

1A  NORM   12:17:48.61
       090.1    V  MIN
       SAG   1.25  SEC

1A  INC    12:17:48.60
       103.1  V

1   INC    12:17:48.55
       098.0  V

1A  INC    12:17:48.05
       096.0  V

1A  INC    12:17:47.96
       094.0  V

1A  DEC    12:17:47.39
       091.9  V

1A  DEC    12:17:47.37
       094.1  V

1A  DEC    12:17:47.36
       101.3  V

1A  LOW    12:17:47.36

1A  DEC    12:17:47.35
       110.8  V

1A  INC    12:16:32.15
       113.0  V
```

626A,G,R,ARA

```
       113.0  V
1A  INC    12:16:32.15

       110.8  V
1A  DEC    12:17:47.35

1A  LOW    12:17:47.36

       101.3  V
1A  DEC    12:17:47.36

       094.1  V
1A  DEC    12:17:47.37

       091.9  V
1A  DEC    12:17:47.39

       094.0  V
1   INC    12:17:47.96

       096.0  V
1A  INC    12:17:48.05

       098.0  V
1A  INC    12:17:48.55

       103.1  V
1A  INC    12:17:48.60

       SAG   1.25  SEC
       090.1    V  MIN
1A  NORM   12:17:48.61

       105.9  V
1A  INC    12:17:48.61

       108.1  V
1A  INC    12:17:48.62

       110.0  V
1   INC    12:17:48.69

       112.1  V
1   INC    12:27:48.86
```


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SECTION III
OPERATIONAL TEST

3.1 GENERAL

This section provides information for performing an operational test to verify that the 6003 plug-in is operating properly.

3.2 SYSTEM CHECK

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6003. Any inputs connected at this time will be automatically disconnected during the system check period. Successful measurement of these signals verifies that the module is fully operational. Expected system check measurement results and allowable tolerances are listed below.

AC Voltage	196.0-204.0 Volts
Impulse Peak	2700-3300 Volts
Impulse Duration	360-440 uSec
Frequency	59.8-60.2 Hz

3.3 SAMPLE SYSTEM CHECK PRINTOUT

A typical system check printout obtained from a 6006 plug-in is illustrated below.

<u>626</u>

```
******************

IMP- 3008V, 0396US
AC VOLTS    199.4V
      PH C
IMP- 3064V, 0395US
AC VOLTS    199.5V
      PH B
IMP- 3103V, 0397US
AC VOLTS    199.8V
      PH A
FRQ    060.0 HZ
   626-PA-6003
      CH 4

TIME = 00:00:12.10
***SYSTEM CHECK***
```

<u>626A,G,R,ARA</u>

```
***SYSTEM CHECK***
TIME = 00:00:12.10

      CH 4
   626-PA-6003
FRQ    060.0 HZ
      PH A
AC VOLTS    199.8V
IMP- 3103V, 0397US
      PH B
AC VOLTS    199.5V
IMP- 3064V, 0395US
      PH C
AC VOLTS    199.4V
IMP- 3008V, 0396US


******************
```

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-110235U-1

VOLUME 1

OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

NOTE: Refer to Volume 2 (Service Manual) of TM-110235U for maintenance data

1 May 1984
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(Rev. 1 Sept. 1985)
(Rev. 1 May 1986)
(Rev. 15 May 1987)
(Rev. 1 Sept. 1989)
(Rev.B)

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IMPORTANT! CALIBRATION INTERVAL

The recommended calibration interval for this unit is once every 12 MONTHS.

We recommend that you return the unit to the factory for calibration. If you decide to do so, first contact the Dranetz Customer Service Department to obtain an authorization number.

Telephone Number:	(908) 287-3680
Telex Number:	499-7808
TWX Number:	(908) 997-9553
FAX Number:	(908) 248-9240
Cable:	DRANETZ

Then fill out the Repair/Service Order form enclosed in this manual and ship it along with the unit to the Dranetz Customer Service Department. (If this form is missing, ask the Dranetz Customer Service Department for a replacement.)

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ALL PRODUCTS OF DRANETZ TECHNOLOGIES, INC. ARE WARRANTED TO THE ORIGINAL PURCHASER AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. DRANETZ WILL REPAIR OR REPLACE, AT ITS OPTION, ALL DEFECTIVE EQUIPMENT RETURNED, FREIGHT PREPAID, DURING THE WARRANTY PERIOD, WITHOUT CHARGE FOR REPAIR, PROVIDED THERE IS NO EVIDENCE THAT THE EQUIPMENT HAS BEEN MISHANDLED OR ABUSED. THIS WARRANTY SHALL NOT APPLY TO ANY DEFECTS RESULTING FROM IMPROPER OR INADEQUATE MAINTENANCE, BUYER-SUPPLIED HARDWARE/SOFTWARE OR INTERFACING, UNAUTHORIZED MODIFICATION OR MISUSE OF THE EQUIPMENT, OPERATION OUTSIDE OF THE ENVIRONMENTAL SPECIFICATIONS FOR THE PRODUCT, OR IMPROPER SITE PREPARATION OR MAINTENANCE.

The information in this manual has been reviewed and is believed to be entirely reliable. No responsibility, however, is assumed for any inaccuracies. The material in this manual is for information purposes only, and is subject to change without notice.

VOLUME 1
OPERATOR'S MANUAL

626-PA-6003 3-PHASE AC MONITOR

SECTION 1
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual, consists of three sections: I) GENERAL INFORMATION, II) INSTALLATION AND OPERATION, and III) OPERATIONAL CHECK. Volume 2, the Service manual, contains the maintenance instructions.

1.2 INTRODUCTION

This manual provides operating instructions for the 626-PA-6003 Plug-in, hereinafter referred to as the 6003, used in the Series 626 Universal Disturbance Analyzer. It is assumed that the reader is familiar with the mainframe information described in Volume 1 of the Mainframe manual.

1.3 PURPOSE

The 6003 monitors disturbances on 3-phase AC power lines with either 50 or 60 Hz nominal frequency. Each phase is monitored on a single voltage range of 0 to 600 V RMS. With thresholds programmed by the user, the 6003 monitors both short and long term power line disturbances. With this plug-in, the unit stores, analyzes, classifies and prints out quantative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The plug-in monitors any 3-phase power line whose RMS values range from a low value of 0 volts to as high as 600 volts. Three types of disturbances are monitored by the 6003: power line frequency, power frequency transients and waveform disturbances. Power frequency transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses", include all conditions that cause the power line waveform to deviate from an ideal waveform. The 6003 measures the peak amplitude of impulses, their polarity and duration. The threshold value of each type of disturbance, as well as the line frequency, above which detection and printout occurs is operator programmable. (All threshold settings are common to all three line phases.) Except for an automatic summary printout at the end of day, disturbance data is normally printed out only when disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of the day. This feature permits long term unattended operation.

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The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

NOTE: Frequency measurements are derived from phase A only. Therefore, if single-phase monitoring is desired, phase A should be used.

1.4 APPLICATIONS

When installed in the 626 mainframe, the 6003 provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the instrument permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

b. To perform pre-installation site surveys. The 6003 can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable instrument, particularly well suited for field use, is ideal for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the instrument provides a clear record of the quality of power supplied during unattended periods.

1.5 EQUIPMENT CHARACTERISTICS

The 6003 is configured as a plug-in module 6.5" high by 1.25" wide by 10" deep. It is designed for installation in one of four slots of the Series 626 Universal Disturbance Analyzer. Technical specifications of the 6003 are presented in Table 1-1.

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Table 1-1. 626-PA-6003 Technical Specifications

Input	2 wire differential Z_{in} = 40 Megohms plus 40 pf (each side to ground)
Input Voltage Range	50-600V RMS
Lower Limit of User-Set Voltage (V_{LOW})	50V to 599V
Upper Limit of User-Set voltage (V_{HIGH})	600V to 51V
Voltage Change Sensitivity (V_{SENS}) (1V Increments)	2 to 60V
Line Voltage Measurement Resolution	0.2V
Line Voltage Measurement Accuracy	±1% of reading, ±0.2% of full scale (75V to 600V)
Line Frequency	
Range	45-65 Hz
Resolution	±0.1 Hz
Accuracy	±0.1 Hz
Impulse Range	50-4000V Pk (1-2000 uSec)
Impulse Peak Resolution	1V
Impulse Accuracy	±10% of reading ±1% F.S. (5 uSec-50 uSec.) (decreasing to ±6 dB from 1 uSec to 2 mSec) 100V-4000V
Impulse Duration Range	1 uSec to 2 mSec
Impulse Duration Resolution	1 uSec

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1.6 STANDARD ACCESSORIES

Model No.	Part No.	Quan.	Description
626PA6003-1 (Barrier, Block Connections)	TM110235U (Vol. 1)	1	Operating Manual
626PA6003-2 (Plug-type Connections)	TM110235U (Vol. 1)	1	Operating Manual
	110480-G1	3	A.C. Cables

1.7 OPTIONAL ACCESSORIES

Part No.	Quan.	Description
TM-110235U (Vol. 2)	1	Service (Maintenance Manual)

1.8 FACTORY REPAIR

When factory repair is desired, proceed as follows:

1. Contact the Dranetz Customer Service Department in order to obtain an Authorization Number.

   Telephone No: (908) 287-3680

   TWX: (908) 997-9553

   FAX: (908) 248-9240

   Telex: 499-7808

   Cable: DRANETZ

2. Fill out the REPAIR/SERVICE ORDER enclosed in this manual and ship it with the malfunctioning equipment to the Dranetz Customer Service Department.

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SECTION II
INSTALLATION AND OPERATION

2.1 INSTALLATION

2.1.1 Selection of Nominal Operation Frequency

Factory set switches in the 6003 optimize the measurements for a nominal frequency of either 50 or 60 Hz. Figure 2-1 locates these switches on the Analog board of the module. Dots on switches on the figure indicate which side of the switch is to be depressed for 60 Hz. For 50 Hz operation, simply reverse all switch positions.

2.1.2 Installation of 6003 in Mainframe

CAUTION: Be sure that all power is removed from the 626 and modules.

a. With the rear panel markings reading correctly, carefully slide the module into the desired slot, with the Digital board within the card-guide tracks until it is firmly seated.

b. Tighten the top and bottom captive screws to secure the module into the mainframe.

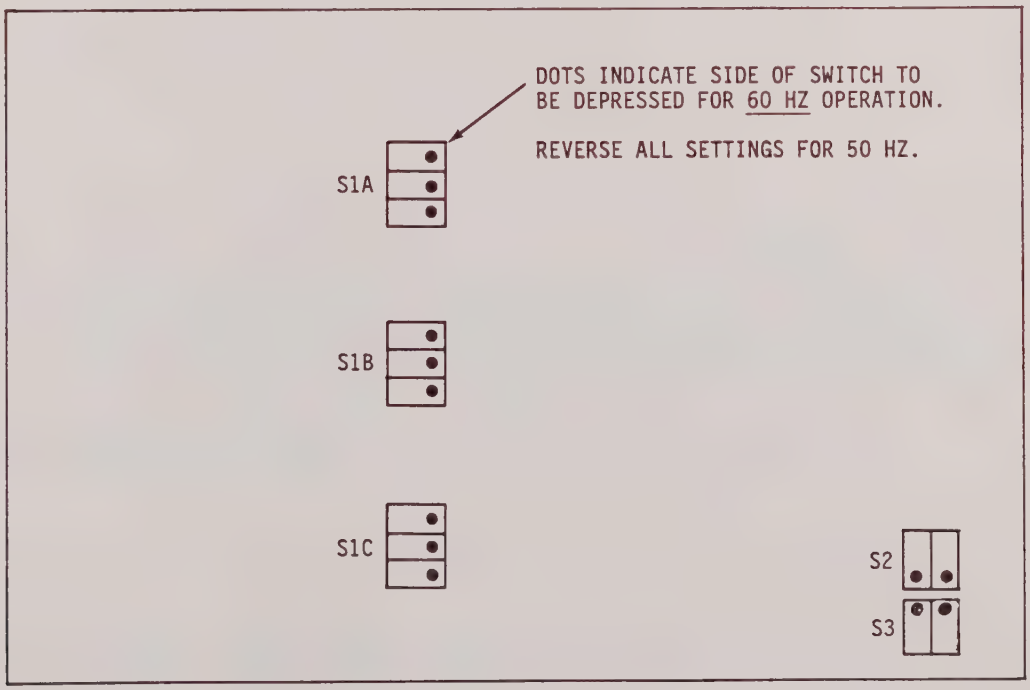

Figure 2-1. Analog Board Switch Locations

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2.1.3 LOAD RATINGS

The Series 626 standard mainframe has an upper limit of the combined total rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating	Plug-in	Load Rating
626-PA-6001	2 Units	626-PA-60012A	3 Units
626-PA-6001 with Extra Option Board	3 Units	626-PA-6013	2 Units
626-PA-6002	2 Units	626-PA-6014	1 Unit
626-PA-6003	4 Units	626-PA-6015	4 Units
626-PA-6005	2 Units	626-PA-6018	4 Units
626-PA-6006	2 Units	626-PA-6020	4 Units
626-PA-6007	1 Unit	626-PA-6024A	4 Units
626-PA-6008	2 Units	626-PA-6024B	4 Units
626-PA-6009	4 Units	626-PA-6025	4 Units
626-PA-6011	1 Unit	626-PA-6030	6 Units
626-PA-6012	2 Units	626-PA-6037	1 Unit
		626-PA-6038	1 Unit
		626-PA-6040	6 Units

NOTE

When selecting modules for installation in any mainframe, verify that the sum of the load ratings of the installed modules DOES NOT exceed 20.

2.2 CONNECTING POWER SOURCE TO MODULE

2.2.1 Connection Procedure

The 6003 is equipped with either three rear panel AC connectors, or a barrier block. Inputs include phase A, B, and C. Connectors must be wired in accordance with the rear panel connector markings (AC high, AC low, and earth ground from top to bottom).

a. Turn the 626 off by inserting the key in FUNCTION key switch on front panel of mainframe and setting the switch to the OFF position.

b. Turn off power source that is to be monitored by the module.

c. Make all connections to the 6003 module first. If the 6003 has been supplied with connectors, merely insert the mating connector, supplied with the unit, until a "click" is heard.

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If the 6003 has been supplied with a barrier block, make all connections to the barrier block first, then be sure to replace the barrier block cover. DO NOT PROCEED UNTIL PARAGRAPH C IS COMPLETE.

d. Make the desired connections to the power source to be monitored.

e. Power up the 626 by turning the FUNCTION key switch to the OPERATE position.

f. Turn on power source to be monitored.

WARNING: Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) and/or any other requirements applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

CAUTION: To avoid damaging the equipment, do not apply AC voltages in excess of 600V RMS to any AC phase input (A,B, or C) of the 6003.

2.2.2 Circuit Applications

WARNING

Connection should only be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 240-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

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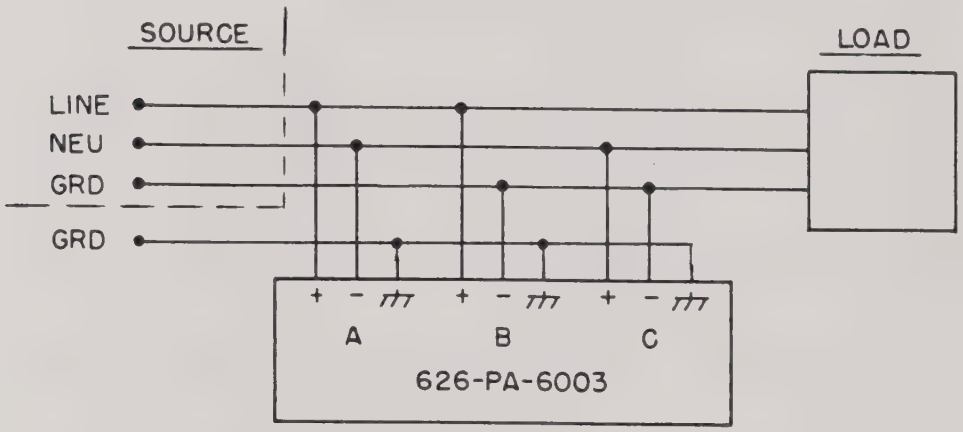
The 3-phase AC monitor for 45-65 Hz may be used for 3Ø Wye, 3Ø Delta, or for up to three separate AC signals. It may be used by itself to do Normal Mode/Common Mode analysis on 1 phase lines, or in combination with a 626-PA-6006 to do Normal Mode/Common Mode analysis on a 3 phase wye line.



1 Phase Normal Mode/Common Mode

Readings:

Channel A: LINE-Neutral
Channel B: LINE-Ground
Channel C: Neutral-Ground

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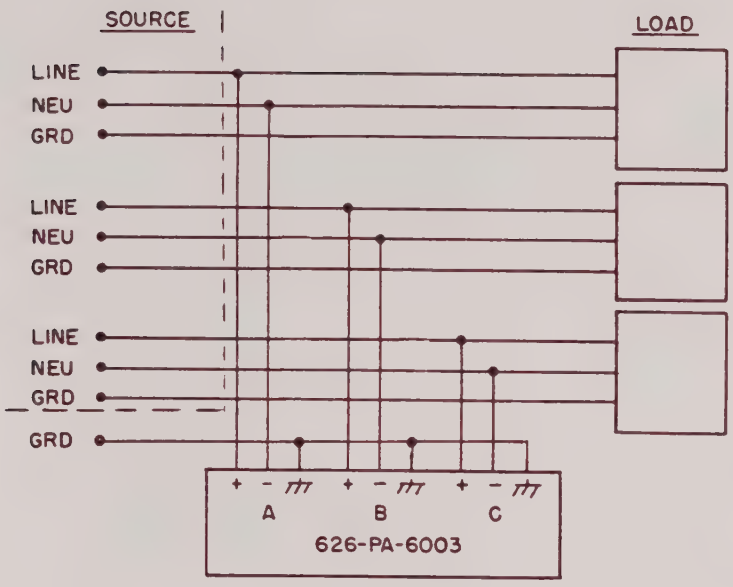
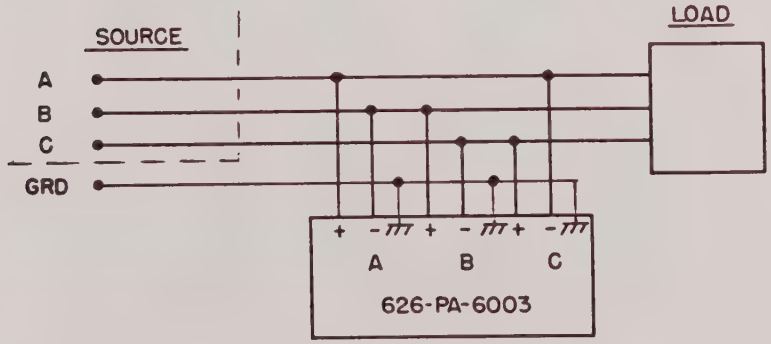


3 Separate AC Lines

Notes

1. All Channels are monitored independently.
2. All line frequencies must be the same.
3. All 3 channels will have same program set-up.



3 Phase Delta

Notes

1. Delta may be grounded or ungrounded
2. Set 626-PA-6003 to monitor line-to-line voltage
   e.g.: For 240 volt delta, set High and Low Limits to either side of 240 VAC.

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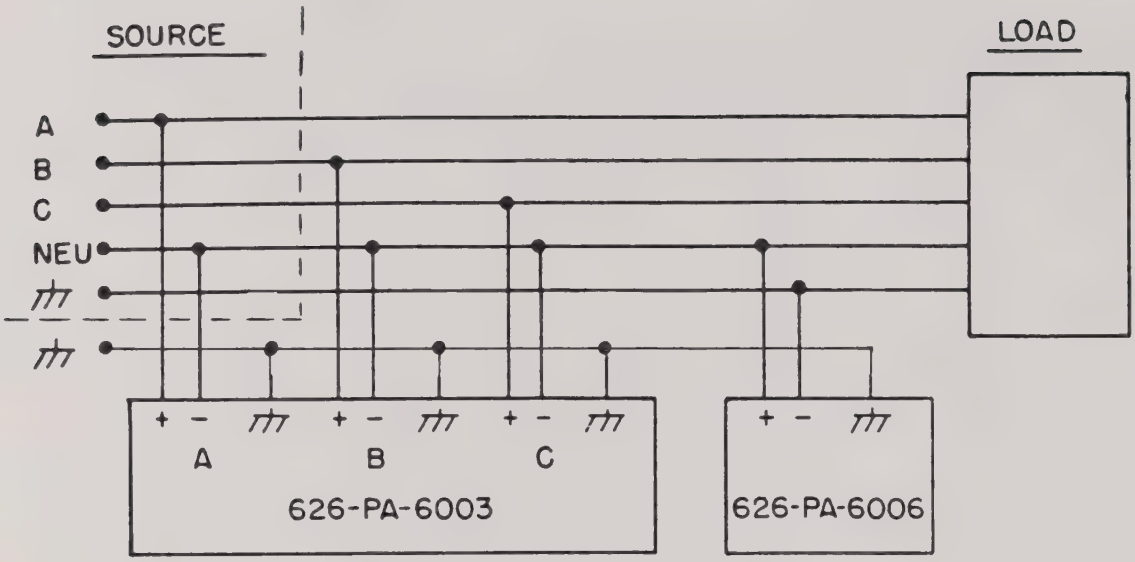

3 Phase Wye

Notes

1. 626-PA-6006 is added to perform Neutral-Ground (COMMON mode) monitoring.

2. Wye distribution is normally monitored Line-to-Neutral, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 120.

3. To monitor wye system line-to-line, set High and Low Limits to either side of higher stated voltage, and connect to 626-PA-6003 as though lines A, B, and C were from a delta, e.g., A 120/208 wye would be monitored with 626-PA-6003 High and Low Limits set to either side of 208.

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2.2.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious Impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of Impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade Potential Transformers for monitoring Impulses on high voltage power lines is not recommended. The limited frequency response of most Potential Transformers may result in substantial variation of Impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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2.3 OPERATING THE 6003

2.3.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6003 operation are described in Table 2-1. Figure 2-2 shows the Series 626 controls used by the 6003 module. For a description of controls common to overall Model 626 operation, refer to Volume 1 of the Mainframe manual.

2.3.2 Programming Procedure

Assume it is desired to program a high limit of 125V, a low limit of 105V, voltage sensitivity of 2 volts, frequency sensitivity of 0.2 Hz and an impulse sensitivity of 50V. Voltage and frequency sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 25 volts, a disturbance is recorded when impulse amplitude rises above 25 volts.

NOTE

1. It is recommended that the HI and LO limits be set to at least 3V (respectively) from the nominal voltage being measured. For example, if monitoring 120V, the high and low limits should be 117V (or less) and 123V (or more), respectively.

2. It is also recommended that the sensitivity be set to at least 2% of the nominal input voltage.

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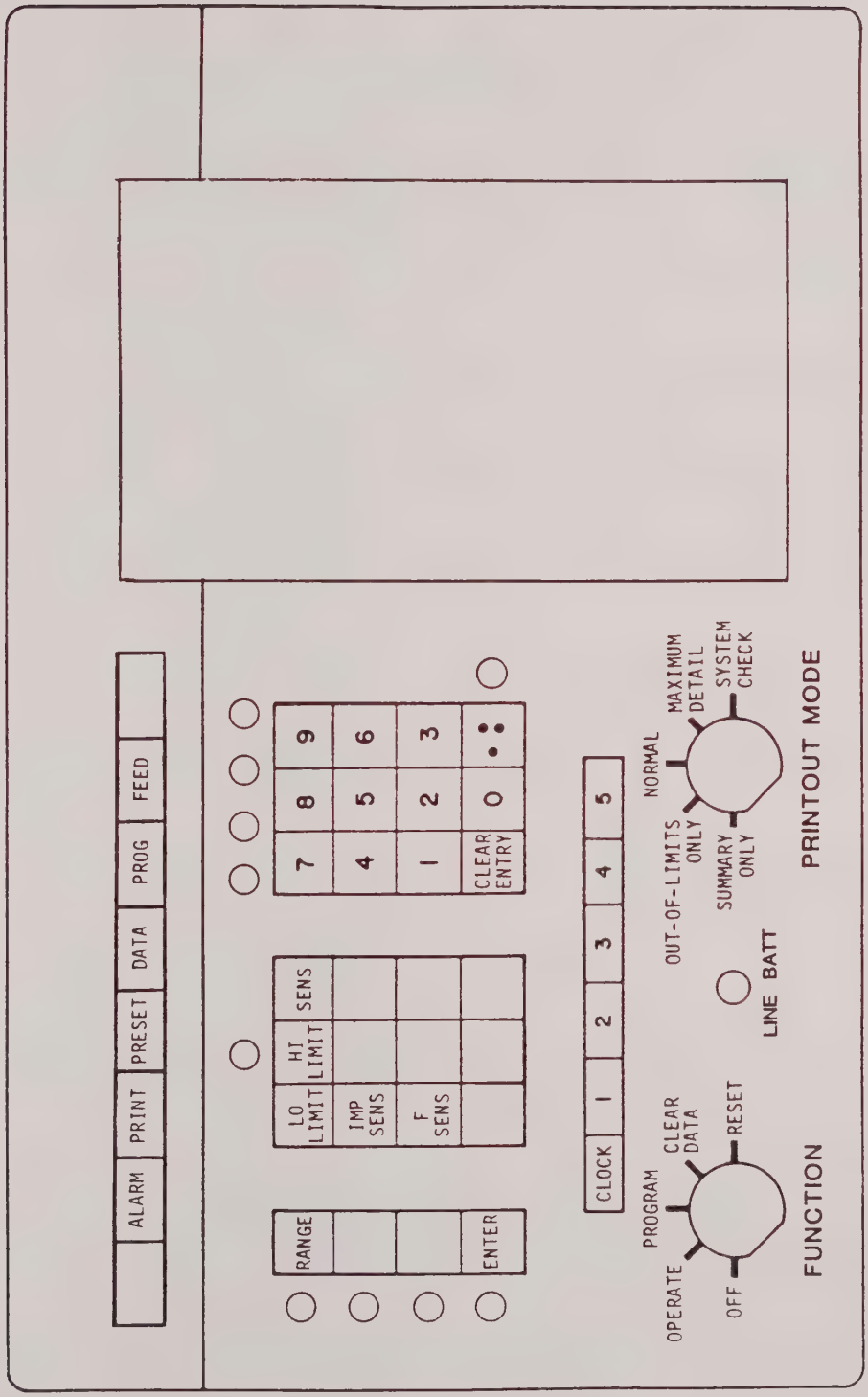

Figure 2-2. Series 626 Controls Used by the 6003 Plug-In

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Table 2-1. 6003 Operating Controls

Item	Function
LO LIMIT pushbutton	When depressed, enables numeric keyboard to program low limit voltage.
HI LIMIT pushbutton	When depressed, enables numeric keyboard to program high limit voltage.
SENS pushbutton	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS pushbutton	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
F SENS pushbutton	When depressed, enables numeric keyboard to program frequency sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6003 memory.
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel switch (1-5) depressed, depressing PRESET switch recalls non-volatile factory program for that channel.

For the example cited, program the 6003 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that a cueing indicator above the center bank of pushbuttons lights. This indicates that a function may be programmed.

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d. Depress the HI LIMIT pushbutton. Program the high limit value (125), using the keyboard.

e. When the ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout and the ENTER indicator will go out.

f. Repeat steps c, d and e for the low limit voltage (105V) using the LO LIMIT pushbutton.

g. Repeat steps c, d and e for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 02.

h. Repeat steps c, d and e for the frequency sensitivity (0.2 Hz), using the F SENS pushbutton and programming the value as 0.2.

i. Repeat steps c, d and e for the impulse sensitivity (0050 volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

626	
IMPULSE SENS	0050V
FREQ SENS	00.2 HZ
VOLTAGE SENS	002 V
V LOW LIMIT	105 V
V HIGH LIMIT	125 V
626-PA-6003	
CH 4	

626A,G,R,ARA	
CH 4	
626-PA-6003	
V HIGH LIMIT	125V
V LOW LIMIT	105V
VOLTAGE SENS	002 V
FREQ SENS	00.2 HZ
IMPULSE SENS	0050V

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits.

j. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

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2.4 SELECTING THE FACTORY PRESET PROGRAM

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below. The printout group generated first is the operator program; the second is the factory program printed after the PRESET button is pressed.

626

IMPULSE SENS 0100V
FREQ SENS 00.5 HZ
VOLTAGE SENS 002V
V LOW LIMIT 105 V
V HIGH LIMIT 125 V
626-PA-6003
CH 1
PROGRAM SUMMARY

IMPULSE SENS 0050V
FREQ SENS 00.2 HZ
VOLTAGE SENS 002 V
V LOW LIMIT 105 V
V HIGH LIMIT 125 V
626-PA-6003
CH 1
PROGRAM SUMMARY

626A,G,R,ARA

PROGRAM SUMMARY
CH 1
626-PA-6003
V HIGH LIMIT 125 V
V LOW LIMIT 105 V
VOLTAGE SENS 002 V
FREQ SENS 00.2 HZ
IMPULSE SENS 0050V

PROGRAM SUMMARY
CH 1
626-PA-6003
V HIGH LIMIT 125 V
V LOW LIMIT 105 V
VOLTAGE SENS 002 V
FREQ SENS 00.5 HZ
IMPULSE SENS 0100V

2.5 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6003, it is recorded and displayed in characteristic manner.

2.5.1 Overvoltage

An overvoltage condition exists when the monitored power line voltage exceeds the user-specified upper limit for more than 2.55 seconds. An overvoltage condition is indicated by a printout such as the following:

4B HI 09:46:07.11

where 4 is the channel number, B is the phase and time is given in hours, minutes and seconds (to .01 sec resolution).

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When the line voltage recovers to normal, a printout such as the following occurs:

626	626A,G,R,ARA
4B NOR Ø9:46:15.2Ø 148.6 V MAX	148.6 V MAX 4B NOR Ø9:46:15.2Ø

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

2.5.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. An undervoltage condition is indicated by a printout such as the following:

```
4C  LO   Ø9:46:15.2Ø
```

When the line voltage returns to normal level, a message such as the following is printed:

626	626A,G,R,ARA
4C NOR Ø9:46:18.45 36.4 V MIN	36.4 V MIN 4C NOR Ø9:46:18.45

indicating when normal voltlage was restored and the value of the lowest voltage reached during the undervoltage interval.

2.5.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected integer voltage between one and 15 volts for a 115-volt line. The following example shows several voltage change printouts. The first shows that Phase A voltage in channel 3 decreased to 1Ø9.2V at time shown. The second printout shows that phase C voltage increased to 115.4V at time shown.

626	626A,G,R,ARA
2C INC Ø1:Ø2:34.56 115.4 V 3A DEC Ø1:Ø2:34.56 1Ø9.2 V	115.4 V 2C INC Ø1:Ø2:34.56 1Ø9.2 V 3A DEC Ø1:Ø2:34.56

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2.5.4 Voltage Surge

A Voltage Surge is defined as a line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
4B   HI   09:45:33.15
```

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

626	626A,G,R,ARA
↑ 4B NOR 09:45:33.38	SURGE 0.23 SEC
128.2 V MAX	128.2 V MAX
SURGE 0.23 SEC	4B NOR 09:45:33.38 ↓

In this case, the time at which the voltage returned to normal is shown as well as the maximum voltage reached and the surge duration.

2.5.5 Voltage Sag

A voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

NOTE

Voltage inputs less than 25V RMS will be printed out as 0.0V on the 6003.

2.5.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

626	626A,G,R,ARA
↑ 2A IMP 10:12:13.45	+0139 V, 0010 US
+0139 V, 0010 US	2A IMP 10:12:13.45 ↓

This printout indicates that an impulse which deviated from normal line voltage by +139 volts peak and whose duration was 10 microseconds was detected on phase A of Channel 2 at the time shown. The impulse magnitude is measured with respect to the instantaneous point on the power frequency sinewave at which it occurs. Impulse polarity is referenced to "+" and "-" markings on rear panel.

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2.5.7 Frequency Change

A frequency change printout is triggered when the line frequency changes more than a preselected amount from the last printed value. The frequency change sensitivity is a user-selected value between Ø.2 Hz and 3.Ø HZ in Ø.1 HZ increments. The following example shows several frequency change printouts.

626	626A,G,R,ARA
3 FRQ 1Ø:16:27.Ø2	Ø6Ø.5 HZ
Ø6Ø.5 HZ	3 FRQ 1Ø:16:27.Ø2
3 FRQ 1Ø:16:24.32	Ø6Ø.Ø HZ
Ø6Ø.Ø HZ	3 FRQ 1Ø:16:24.32
3 FRQ 1Ø:16:17.Ø2	Ø59.5. HZ
Ø59.5 HZ	3 FRQ 1Ø:16:17.Ø2

2.6 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise. The following example printouts show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in phase A of Channel 1 and that the limits for Channel 1 were programmed as follows:

V LOW LIMIT	1Ø5 Vrms
V HIGH LIMIT	125 Vrms
V SENSITIVITY	2 Vrms

The example printouts are referenced to figures 2-3 and 2-4 which illustrate overvoltage and voltage sag disturbances, respectively.

Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

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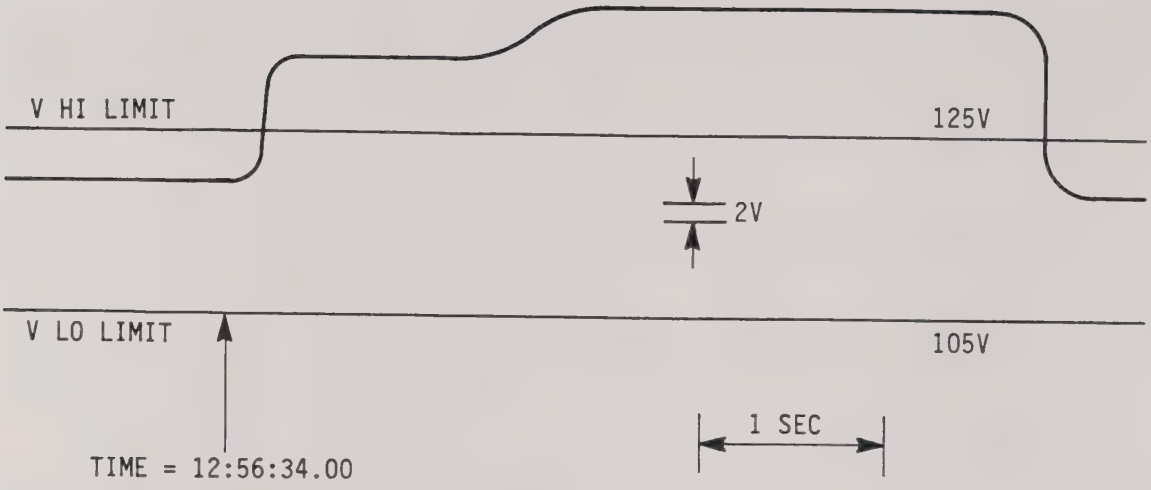

Figure 2-3. Overvoltage Disturbance (6003)

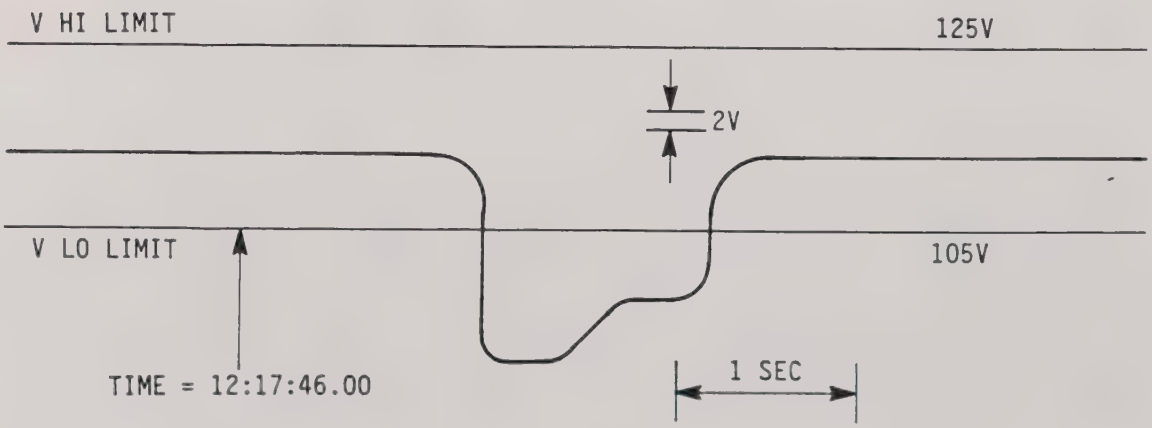

Figure 2-4. Voltage Sag Disturbance (6003)

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The first printout group generated below illustrates overvoltage (fig. 2-3) in the NORMAL mode. The second (3-line) group illustrates overvoltage in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:56:38.51
    139.1  V  MAX

1A  HI    12:56:34.21
```

626A,G,R,ARA

```
1A  HI    12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V   MAX
1A  NOR    12:56:38.51
```

↑

```
1A  NOR   12:56:38.51
    139.1  V  Max

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3 V

1A  INC   12:56:35.62
    135.3 V

1A  INC   12:56:35.40
    133.3 V

1A  INC   12:56:34.22
    131.3 V

1A  INC   12:56:34.21
    129.2 V

1A  HI    12:56:34.21
```

↓

```
1A  HI    12:56:34.21

    139.1  V   MAX
1A  NOR   12:56:38.51
```

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The following is a printout of overvoltage (fig. 2-3) in the MAXIMUM DETAIL mode.

626

```
1A  DEC   12:56:38.61
    119.8  V

1A  DEC   12:56:38.53
    121.8  V

1A  DEC   12:56:38.51
    124.0  V

1A  NORM  12::56:38.51
    139.1  V  MAX

1A  DEC   12:56:38.50
    130.2  V

1A  INC   12:56:35.78
    137.3

1A  INC   12:56:35.62
    135.3  V

1A  INC   12:56:35.40
    133.3  V

1A  INC   12:56:34.22
    131.3  V

1A  INC   12:56:34.21
    129.2  V

1A  HIGH  12:56:34.21

1A  INC   12:56:34.20
    121.1  V

1A  INC   12:50:12.34
    119.0  V
```

626A

```
    119.0  V
1A  INC   12:50:12.34

    121.1  V
1A  INC   12:56:34.20

1A  HIGH  12:56:34.21

    129.2  V
1A  INC   12:56:34.21

    131.3  V
1A  INC   12:56:34.22

    133.3  V
1A  INC   12:56:35:40

    135.3  V
1A  INC   12:56:35.62

    137.3  V
1A  INC   12:56:35.78

    130.2  V
1A  DEC   12:56:38.50

    139.1  V
1A  NORM  12:56:38.51

    124.0  V
1A  DEC   12:56:38.51

    121.8  V
1A  DEC   12:56:38.53

    119.8  V
1A  DEC   12:56:38.61
```


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The first group of generated printouts below illustrates voltage sag (fig. 2-4) in the NORMAL mode. The second group illustrates voltage sag in the OUT-OF-LIMITS ONLY mode.

626

```
1A  NOR   12:17:48.61
    Ø9Ø.1  V  MIN
    SAG  1.25 SEC

1A  LOW   12:17:47.36


1A  NORM  12:17:48.61
    Ø9Ø.1   V  MIN
    SAG   1.25 SEC

1A  INC   12:17:48.6Ø
    1Ø3.1  V

1A  INC  12:17:48.55
    Ø98.Ø  V

1A  INC   12:17:48.Ø5
    Ø96.Ø  V

1A  INC   12:17:47.96
    Ø94.Ø  V

1A  DEC   12:17:47.39
    Ø91.9  V

1A  DEC   12:17:47.37
    Ø94.1  V

1A  DEC   12:17:47.36
    1Ø1.3  V

1A  LOW   12:17:47.36
```

626A,G,R,ARA

```
1A  LOW    12:17:47.36

    1Ø1.3   V
1A  DEC    12:17:47.36

    Ø94.1   V
1A  DEC    12:17:47.37

    Ø91.9   V
1A  DEC    12:17:47.39

    Ø94.Ø   V
1A  INC    12:17:47.96

    Ø96.Ø   V
1A  INC    12:17:48.Ø5

    Ø98.Ø   V
1A  INC    12:17:48.55

    1Ø3.1   V
1A  INC    12:17:48.6Ø

    SAG   1.25 SEC
    Ø9Ø.1   V  MIN
1A  NORM   12:17:48.61


1A   LOW   12:17:47.36

     SAG  1.25 SEC
     Ø9Ø.1  V   MIN
1A   NOR   12:17:48.61
```

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The following printout illustrates voltage sag (fig. 2-4) in the MAXIMUM DETAIL mode.

626

```
1A  DEC   12:27:48.86
    112.1  V

1A  INC   12:17:48.69
    110.0  V

1A  INC   12:17:48.62
    108.1  V

1A  INC   12:17:48.61
    105.9

1A  NORM  12:17:48.61
    090.1   V  MIN
    SAG   1.25  SEC

1A  INC   12:17:48.60
    103.1  V

1   INC   12:17:48.55
    098.0  V

1A  INC   12:17:48.05
    096.0  V

1A  INC   12:17:47.96
    094.0  V

1A  DEC   12:17:47.39
    091.9  V

1A  DEC   12:17:47.37
    094.1  V

1A  DEC   12:17:47.36
    101.3  V

1A  LOW   12:17:47.36

1A  DEC   12:17:47.35
    110.8  V

1A  INC   12:16:32.15
    113.0  V
```

626A,G,R,ARA

```
    113.0  V
1A  INC   12:16:32.15

    110.8  V
1A  DEC   12:17:47.35

1A  LOW   12:17:47.36

    101.3  V
1A  DEC   12:17:47.36

    094.1  V
1A  DEC   12:17:47.37

    091.9  V
1A  DEC   12:17:47.39

    094.0  V
1   INC   12:17:47.96

    096.0  V
1A  INC   12:17:48.05

    098.0  V
1A  INC   12:17:48.55

    103.1  V
1A  INC   12:17:48.60

    SAG   1.25  SEC
    090.1   V  MIN
1A  NORM  12:17:48.61

    105.9  V
1A  INC   12:17:48.61

    108.1  V
1A  INC   12:17:48.62

    110.0  V
1   INC   12:17:48.69

    112.1  V
1   INC   12:27:48.86
```


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SECTION III
OPERATIONAL TEST

3.1 GENERAL

This section provides information for performing an operational test to verify that the 6003 plug-in is operating properly.

3.2 SYSTEM CHECK

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6003. Any inputs connected at this time will be automatically disconnected during the system check period. Successful measurement of these signals verifies that the module is fully operational. Expected system check measurement results and allowable tolerances are listed below.

AC Voltage	196.0-204.0 Volts
Impulse Peak	2700-3300 Volts
Impulse Duration	360-440 uSec
Frequency	59.8-60.2 Hz

3.3 SAMPLE SYSTEM CHECK PRINTOUT

A typical system check printout obtained from a 6006 plug-in is illustrated below.

<u>626</u>

```
******************


IMP- 3008V, 0396US
AC VOLTS    199.4V
       PH C
IMP- 3064V, 0395US
AC VOLTS    199.5V
       PH B
IMP- 3103V, 0397US
AC VOLTS    199.8V
       PH A
FRQ    060.0 HZ
   626-PA-6003
       CH 4

TIME = 00:00:12.10
***SYSTEM CHECK***
```

<u>626A,G,R,ARA</u>

```
***SYSTEM CHECK***
TIME = 00:00:12.10

       CH 4
   626-PA-6003
FRQ    060.0 HZ
       PH A
AC VOLTS    199.8V
IMP- 3103V, 0397US
       PH B
AC VOLTS    199.5V
IMP- 3064V, 0395US
       PH C
AC VOLTS    199.4V
IMP- 3008V, 0396US


******************
```

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) or any other requirements, or both, which may be applicable to the user.

Installation, operation, and maintenance should only be performed by qualified personnel.

TM-111805-1

VOLUME 1 -- OPERATOR'S MANUAL

626-PA-6005

AC CURRENT MONITOR

1 May 1985

(Revised 8/1/85)
(Revised 9/1/85)
(Revised 9/1/89)
(Rev. B)

See opposite side relative to proprietary rights

NOTE: Refer to Volume 2 (Service Manual) TM-111805 for maintenance information.

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HAWKER SIDDELEY DRANETZ

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IMPORTANT! CALIBRATION INTERVAL

The recommended calibration interval for this unit is once every 12 MONTHS.

We recommend that you return the unit to the factory for calibration. If you decide to do so, first contact the Dranetz Customer Service Department to obtain an authorization number.

Telephone No:	(908) 287-3680
Telex:	499-7808
TWX:	(710) 997-9553
FAX:	(908) 248-9240
Cable:	DRANETZ

Then fill out the Repair/Service Order form enclosed in this manual and ship it along with the unit to the Dranetz Customer Service Department. (If this form is missing, ask the Dranetz Customer Service Department for a replacement.)

STATEMENT OF WARRANTY

ALL PRODUCTS OF DRANETZ TECHNOLOGIES, INC. ARE WARRANTED TO THE ORIGINAL PURCHASER AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. DRANETZ WILL REPAIR OR REPLACE, AT ITS OPTION, ALL DEFECTIVE EQUIPMENT RETURNED, FREIGHT PREPAID, DURING THE WARRANTY PERIOD, WITHOUT CHARGE FOR REPAIR, PROVIDED THERE IS NO EVIDENCE THAT THE EQUIPMENT HAS BEEN MISHANDLED OR ABUSED. THIS WARRANTY SHALL NOT APPLY TO ANY DEFECTS RESULTING FROM IMPROPER OR INADEQUATE MAINTENANCE, BUYER-SUPPLIED HARDWARE/SOFTWARE OR INTERFACING, UNAUTHORIZED MODIFICATION OR MISUSE OF THE EQUIPMENT, OPERATION OUTSIDE OF THE ENVIRONMENTAL SPECIFICATIONS FOR THE PRODUCT, OR IMPROPER SITE PREPARATION OR MAINTENANCE.

The information in this manual has been reviewed and is believed to be entirely reliable. No responsibility, however, is assumed for any inaccuracies. The material in this manual is for information purposes only, and is subject to change without notice.

VOLUME 1
OPERATOR'S MANUAL

626-PA-6005 AC CURRENT MONITOR

SECTION I
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual), is divided into three sections: I) GENERAL INFORMATION, II) INSTALLATION AND OPERATION, and III) OPERATIONAL TEST. Volume 2, the Service manual, contains the maintenance instructions and consists of four sections, IV through VII. (See Volume 2 for a description of these sections.)

1.2 INTRODUCTION

This manual provides the operating instructions for the 626-PA-6005 AC Current Monitor plug-in, referred to as the 6005 plug-in. The 6005 plug-in is designed for installation into the Series 626 Universal Disturbance Analyzer Mainframe, referred to as the Series 626. Before reading these instructions, read the Mainframe information described in Volume 1 of the Mainframe manual.

1.3 PURPOSE

The 6005 plug-in is single channel and phase. It enables the Series 626 to detect, measure, and record disturbances in ac current. The 6005 plug-in uses a current transformer for circuit monitoring, which thus eliminates the need for splicing into the circuit. Current input ranges, thresholds, and sensitivity settings are selected from the front panel keyboard.

The 6005 plug-in has an overall range of 0.5 to 300 amps ac, and is programmable in three ranges. With user programmed thresholds, the 6005 plug-in stores, analyzes, classifies, and prints out both qualitative and quantitative disturbance data. The time when each disturbance occurs is also printed out. (Time is measured by a highly accurate crystal-controlled 24-hour clock built into the Series 626 Mainframe.)

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1.4 APPLICATIONS

The 6005 plug-in may be used to:

a) track true rms current variations with respect to time,

b) monitor inrush current at sites with power conditioning,

c) analyze operation of protective devices (i.e., circuit breakers, static switches, relays, etc.),

d) detect current impulses, and

e) monitor neutral and ground currents.

1.5 FEATURES

The 6005 plug-in has the following features:

¶ Single Channel, Single Phase Plug-In Module

¶ User Selected Ranges, Thresholds, and Sensitivity

¶ Clamp-On Current Probe Input

¶ Complete Field Compatibility with the Series 626

1.6 DISTURBANCE MONITORING

The 6005 plug-in monitors two types of disturbances: ac current transients and waveform disturbances (impulses).

NOTE

All recorded measurements are in true rms with the exception of current impulses which are measured in peak amperes.

Current transients are divided into into five display categories:

1) Overcurrents
2) Undercurrents
3) Current Changes
4) Current Surges
5) Current Sags

Waveform disturbances (impulses) include all conditions which cause the power line waveform to deviate from an ideal waveform.

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The threshold value of each disturbance, beyond which a printout occurs, is operator programmable. With the exception of an automatic summary printout at the end of each day, disturbance data is normally printed when the Series 626 is triggered by a disturbance.

In an alternate mode, however, a disturbance data summary printout will only occur at the end of each day. This feature is useful if the unit is operated unattended for long terms.

The threshold program may easily be altered using the front panel key switches. Cueing indicators adjacent to the red, green, and yellow keys simplify the programming procedure. A backup program for the plug-in, which is stored in hard memory at Dranetz Technologies, Inc., may always be recalled upon operator demand. Both the program and disturbance data in the data accumulators may likewise be printed upon demand.

1.7 EQUIPMENT CHARACTERISTICS

The 6005 plug-in module is 6½" high by 1¼" wide by 10" deep. It is designed for installation into any one of the five slots of the Series 626 Mainframe. Technical specifications of the 6005 plug-in are listed in table 1-1 below.

Table 1-1. 626-PA-6005 AC Current Monitor Technical Specifications

Input Current Frequency:	45 to 65 Hz
Current Measurement Accuracy:	±2% of reading ± Ø.5% of full scale
Maximum Crest Factor (Peak/rms):	2 @ 100% full scale 4 @ 50% full scale 7 @ 30% full scale
Impulse Accuracy:	±10% of reading ±1% full scale for half sine wave impulses of 5 to 50 microseconds, typically -6 dB at 2 microsecond and 2 millisecond durations.
Sampling Rate:	20 mSec
TRMS Settling Time	
Increasing:	15 mSec
Decreasing:	30 mSec

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Table 1-1. 626-PA-6005 AC Current Monitor Technical Specifications (cont'd)

Range Information

Full Scale Ranges:	75 A rms	150 A rms	300 A rms
Overall Input Range:	1.Ø to 75	2.Ø to 150	4.Ø to 300
Lower Limit of User Set Current (1A incr.):	0 to 74	0 to 149	0 to 299
Upper Limit of User Set Current (1A incr.):	1 to 75	2 to 150	4 to 300
Current Change Sensitivity (1A increments):	1 to 15	2 to 30	4 to 60
True rms Current Resolution:	Ø.2A rms	Ø.4A rms	Ø.8A rms
Impulse Ranges (2 µSec to 1 mSec):	25 to 500 A peak	50 to 1000 A peak	100 to 2000 A peak
User Set Impulse Thresholds (1A incr.):	25 to 500	50 to 1000	100 to 2000

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1.8 STANDARD ACCESSORIES

Part #	Quantity	Description
TM-111805 Volume 1	1	Operator's Manual
TR-2019A	1	Clamp-on Current Probe

1.9 OPTIONAL ACCESSORIES

Part #	Quantity	Description
TM-111805 Volume 2	1	Service (Maintenance) Manual

1.10 FACTORY REPAIR

When factory repair is required, proceed as follows:

1. Contact the Dranetz Customer Service Department in order to obtain an Authorization Number for factory repair.

   Telephone No: (908) 287-3680

   Telex: 499-7808

   TWX: (710) 997-9553

   FAX: (908) 248-9240

   Cable: DRANETZ

2. Fill out the REPAIR/SERVICE form enclosed in the Series 626 Operating Manual. Ship it along with the malfunctioning equipment to the Dranetz Customer Service Department.

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SECTION II
INSTALLATION AND OPERATION

2.1 INSTALLATION

To install the 6005 plug-in into the Mainframe, proceed as follows:

CAUTION

Be sure that the Series 626 Mainframe and all of the power connected to its modules is first turned OFF.

1. Position the top and bottom front corners of the plug-in module into the upper and lower tracks of the desired slot position at the rear of the Series 626 Mainframe.

2. Carefully slide the module into the Mainframe until it is firmly in position.

3. Tighten the top and bottom captive screws in order to secure the module to the Mainframe.

2.1.1 Load Ratings

The 626 standard mainframe has an upper limit of the combined total rating of its installed modules. The overall mainframe capacity is 20 units, and individual modules have load rating as follows:

Table 2-1. Load Ratings

Plug-in	Load Rating	Plug-in	Load Rating
626-PA-6001	2 Units	626-PA-60012A	3 Units
626-PA-6001 with Extra Option Board	3 Units	626-PA-6013	2 Units
		626-PA-6014	1 Unit
		626-PA-6015	4 Units
626-PA-6002	2 Units	626-PA-6018	4 Units
626-PA-6003	4 Units	626-PA-6020	4 Units
626-PA-6005	2 Units	626-PA-6024A	4 Units
626-PA-6006	2 Units	626-PA-6024B	4 Units
626-PA-6007	1 Unit	626-PA-6025	4 Units
626-PA-6008	2 Units	626-PA-6030	6 Units
626-PA-6009	4 Units	626-PA-6037	1 Unit
626-PA-6011	1 Unit	626-PA-6038	1 Unit
626-PA-6012	2 Units	626-PA-6040	6 Units

NOTE: When selecting modules for installation into any Series 626 Mainframe, verify that the sum of the load ratings of the installed modules DOES NOT exceed 20 Units.

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2.2 CONNECTING THE CURRENT PROBE TO THE PLUG-IN MODULE

CAUTION

To avoid damaging the equipment, DO NOT measure ac voltages in excess of 600 V rms with the 6005 plug-in.

WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1), or any other requirements, or both, which may be applicable to the user.

Installation, operation, and maintenance should only be performed by qualified personnel.

The 6005 plug-in is supplied with a 4-pin connector. To connect the current probe to the 6005 plug-in, proceed as follows:

1. Turn OFF the ac power to the line that is going to be monitored.

2. Insert the key into the FUNCTION key switch on the front panel of the Series 626 Mainframe. Turn the key counterclockwise to the "OFF" position (if it is not already in such a position).

3. Insert the connector into the connector port on the rear panel of the 6005 plug-in. Press the connector firmly into place until a snap is heard.

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2.2.1 Current Probe Polarity

Figure 2-1 below illustrates the proper polarity required for the current probe connection.

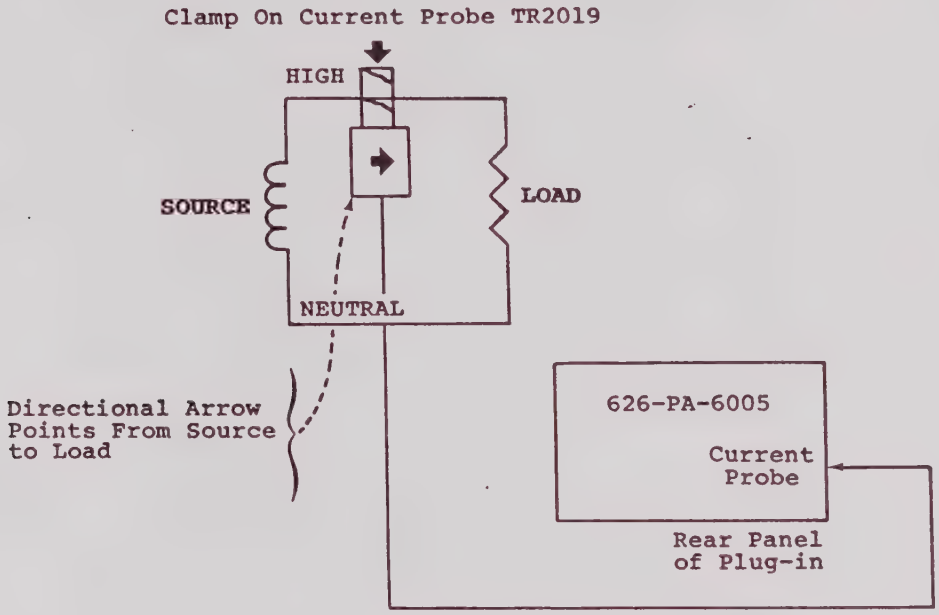

Figure 2-1. Proper Connections of the 626-PA-6005 with the TR-2019 Current Probe

2.2.2 Circuit Applications

WARNING

Connection should ONLY be performed by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, the minimum flexible cord size is No. 18 (1 mm^2). For branch circuits with higher ampacity, refer to the National Electric Code (ANSI C1-1975 Paragraphs 240-4 and 250-95). Special consideration of ground may be required. Refer to Article 250 of the above reference if in doubt. Outside of the U.S.A., consult any applicable safety standards.

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2.3 Installation Guidelines

To properly monitor and analyze ac current disturbances, pay careful attention to the method of connection between the Series 626 and the monitored circuit. Follow the below guidelines to obtain the most accurate and relevant data from the monitored current.

- ¶ If you are monitoring a power line which is connected to critical, sensitive load equipment, connect the test cable as close to the load end of the power line as possible. For three-phase loads, connect the Series 626 in the same way as the load equipment, i.e., phase-to-phase or phase-to-neutral.

- ¶ It is NOT RECOMMENDED that you use instrument-grade current and potential transformers for monitoring impulses on high current/voltage power lines. The limited frequency response of most instrument-grade transformers may result in substantial variation of impulse amplitude.

- ¶ The Series 626 is designed to operate from disturbed power lines; therefore, you may connect the Series 626 power supply to the same power line that is being monitored. However, be aware that the extensive transient suppression, incorporated with the Series 626 power supply, may alter the transient characteristics of the ac power line to which the power supply is connected. To prevent alteration of the transient characteristics of the monitored power line, separate the Series 626 power supply input from the monitored inputs.

2.4 OPERATING THE 6005 PLUG-IN

Table 2-2 on the following page lists the operating controls and indicators of the Series 626 that are used by the 6005 plug-in. Figure 2-2 on the page after illustrates these controls on a typical front panel layout. (Only those keys used by the 6005 plug-in are labeled on the front panel illustration.) For a description of the controls common to overall Series 626 operation, refer to Volume 1 of the Mainframe manual.

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2.4.1 Operating Controls and Indicators

The 6005 plug-in uses a menu-style format for selecting items and thresholds.

Table 2-2. 626-PA-6005 Operating Controls

ITEM	FUNCTION
Numeric Keyboard * Numeric Keyboard LEDs	To select menu items & set thresholds. The number of lit LEDs indicates the number of digits required for an entry.
[RANGE] key and LED	When the LED lights, the user should depress [RANGE], and then enter the desired full scale current range (075, 150, or 300) via the numeric keyboard.
[LO LIMIT] key	When depressed, enables numeric keyboard to program the current low limit.
[HI LIMIT] key	When depressed, enables numeric keyboard to program current high limit.
[SENS] key	When depressed, enables numeric keyboard to program the current sensitivity value.
[IMP SENS] key	When depressed, enables the numeric keyboard to program the impulse sensitivity value.
[ENTER] key	When depressed, transfers numeric keyboard entry into 6005 plug-in memory.
[DATA] push button	With the FUNCTION key switch set at "OPERATE", depressing [DATA] produces a data summary printout.
[PROG] push button	With the FUNCTION key switch set at "OPERATE", depressing [PROG] produces a program summary printout.
[PRESET] push button	With the FUNCTION key switch set at "PROGRAM" and a channel push button (1-5) depressed, depressing [PRESET] returns all of the programmed parameters of that channel to their "Factory Preset" values.
OTHER FRONT PANEL CONTROLS AND INDICATORS	Refer to Volume 1 of the Series 626 Mainframe Manual (Operator's Manual).

* -"Key" and "keyboard" represent the red, green, and yellow keys. "Push button" represents the black selector buttons.

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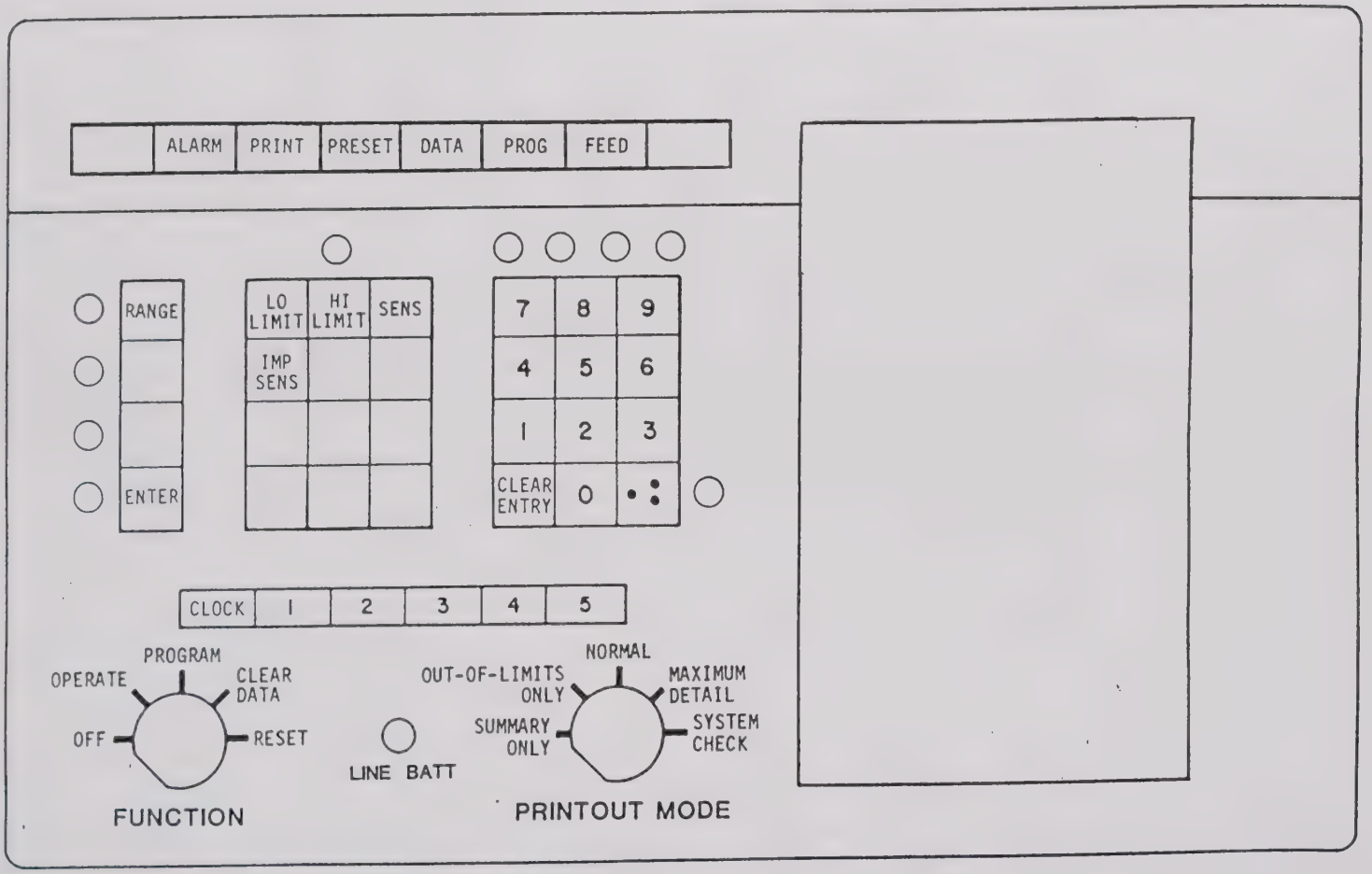

Figure 2-2. Series 626 Controls used by the 6005 Plug-in

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2.5 PROGRAMMING PROCEDURE

The best way to explain the programming of the 6005 plug-in (via the Series 626) is through an illustrated example. Assume that you want to program the Series 626 for:

1. A full scale range of 150 amps.
2. A high limit of 125 amps.
3. A low limit of 105 amps.
4. Current sensitivity of 2 amps.
5. Impulse sensitivity of 100 amps.

Current sensitivity sets the deviation threshold from the present value (2 amps in this example). A current deviation of 2 or more amps will cause the Series 626 to record the disturbance.

For impulse measurements, the impulse sensitivity corresponds to the absolute threshold. For an impulse sensitivity of 100 amps (this example), a disturbance would be recorded when the impulse amplitude (spike) is 100 amps or greater.

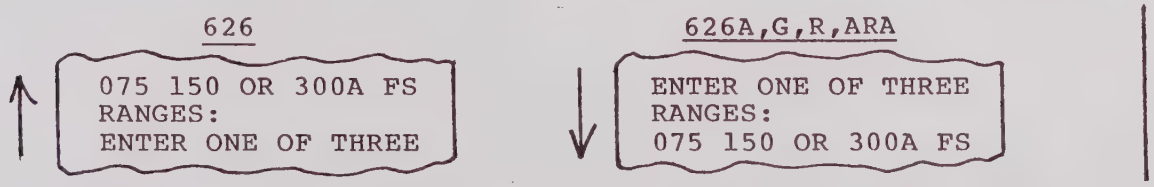
For the above example, program the Series 626 as follows:

a) Turn the FUNCTION key to the "PROGRAM" position.

b) Depress the channel push button (1-5) which corresponds to the slot position of the 6005 plug-in. Note that the program summary for the channel is immediately printed.

c) Note that the red LED adjacent to the [RANGE] key lights. Depress [RANGE].

d) Note that the three yellow LEDs above the numeric keyboard now light. The following is printed:



Using the numeric keyboard, enter [1][5][0]. One lamp will go out for every digit entered. This selects the first full scale range (2.0 to 150 amps). If an error is made during entry, depress [CLEAR ENTRY] and re-enter the entire entry.

e) Once the full scale value has been programmed, the green LED adjacent to the [ENTER] key lights. Depress this key to enter the value into memory. The full scale entry, "RANGE F.S. 150 A", will be echoed back on a printout.

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f) One red LED above the center bank of keys will light. This indicates the unit is ready for another programmed function.

g) Depress the [HI LIMIT] key. Program the high limit value, [1][2][5], as in step d.

h) Depress [ENTER]. The programmed high limit will be echoed back in a printout: "HIGH LIMIT 125 A".

i) Repeat steps f, g, and h for the low limit value, [1][0][5], using the [LO LIMIT] key in place of the [HI LIMIT] key. The programmed low limit will be: "LOW LIMIT 105 A".

j) Repeat steps f, g, and h for the current sensitivity (2 amps), using the [SENS] key and programming the current value as [0][2]. The programmed current sensitivity will be printed: "SENSITIVITY 002 A".

k) Repeat steps f, g, and h for the impulse sensitivity (100 amps), using the [IMP SENS] key and programming the impulse sensitivity as [0][1][0][0]. The programmed impulse sensitivity will be printed as: "IMPULSE SENS 0100A".

l) Turn the FUNCTION key counterclockwise to the "OPERATE" position, and then immediately back to "PROGRAM". The program summary will be printed as follows:

626

```
IMPULSE SENS 0100 A
SENSITIVITY  002  A
LOW LIMIT    105  A
HIGH LIMIT   125  A
RANGE F.S.   150  A
   626-PA-6005
      CH #
PROGRAM SUMMARY
```

626A,G,R,ARA

```
PROGRAM SUMMARY
      CH #
   626-PA-6005
RANGE F.S.   150  A
HIGH LIMIT   125  A
LOW LIMIT    105  A
SENSITIVITY  002  A
IMPULSE SENS 0100 A
```

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits if the range is changed without first reprogramming the limits. For example: If you select a full scale value of 150 A, and you then try to select 153 A as the low limit, the Series 626 will print the error message "ENTRY TOO HIGH". The yellow LEDs will relight, awaiting another entry.

When the 6005 plug-in program is completed, you may proceed to program another module (by depressing another channel number), or place the instrument on-line by turning the FUNCTION key counter-clockwise to the "OPERATE" position. While on-line, you may print the program summary by depressing the [PROG] push button.

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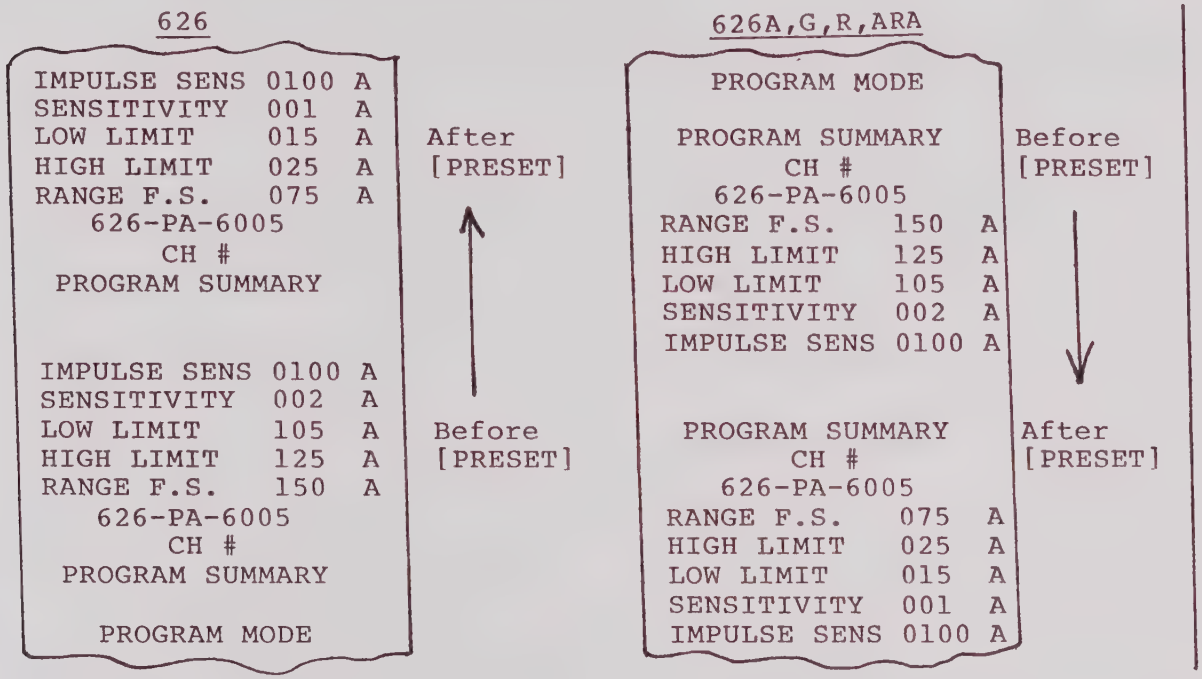
2.5.1 Selecting The Factory Preset Program

To select the program stored in hard memory, turn the FUNCTION key to the "PROGRAM" position, and depress 6005 plug-in's channel number. The most recent operator-set program will be printed. Depress the [PRESET] push button to recall the "Factory Preset" program. An example of this sequence appears below:



Afterwards, turn the FUNCTION key back to "OPERATE". The "Factory Preset" program will be retained in the memory and the previous program setup will be erased.

2.6 DESCRIPTION OF THE DATA PRINTOUTS

When any of the disturbances in the subsections below are detected by the 6005 plug-in, they are recorded and displayed in the described manner.

2.6.1 Overcurrent

An overcurrent condition exists when the monitored ac line current exceeds the user-specified upper limit for more than 2.55 seconds. The beginning of an overcurrent condition is indicated by a printout such as the following:

```
2 HIGH 12:34:56.78
```

Where: 2 is the channel number, HIGH indicates overcurrent, and time is given in hrs:min:sec (to .01 second resolution).

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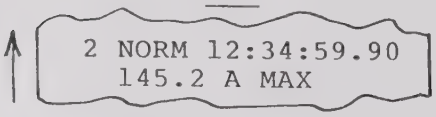
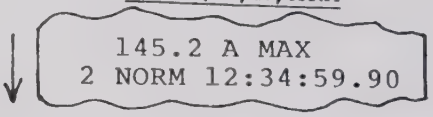
When the ac current returns to its in-tolerance range, a printout such as the following is displayed:

626



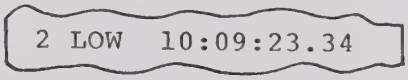
626A,G,R,ARA



This printout indicates the time when the normal current was restored and the value of the highest current reached during the overcurrent condition (in this case, 145.2 amps).

2.6.2 Undercurrent

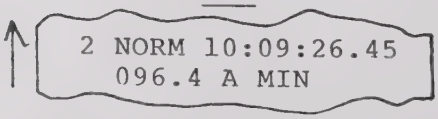
An undercurrent condition exists when the monitored power line current remains below the user-specified lower limit for more than 2.55 seconds. The beginning of an undercurrent condition is indicated by a printout such as the following:



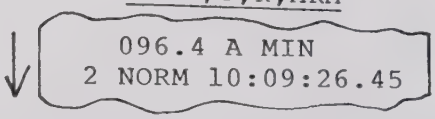
Where: LOW indicates the undercurrent.

When the current returns to its in-tolerance range, a message such as the following is printed:

626



626A,G,R,ARA

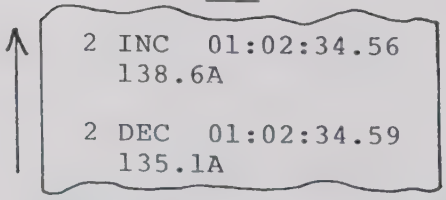


This printout indicates the time when the normal current was restored and the lowest current value achieved during the undercurrent interval.

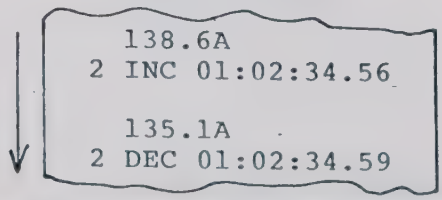
2.6.3 Current Change

A current change printout is triggered when the line current changes more than a selected amount from the most recently printed value.* The sensitivity is a user-selected value varying with the full scale range selected. For example, in the 150 amp range, a sensitivity between the range of 2 to 30 amps may be selected. The following example illustrates two current change printouts (an increase to 138.6 A and a decrease to 135.1 A).

626



626A,G,R,ARA



* -If the current change occurs within the same waveform cycle, an increase or decrease greater than the selected sensitivity may be printed.

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2.6.4 Current Surge

A current surge is defined as an ac current which increases through a user-selected upper limit and then returns to an in-tolerance range in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

```
2 HIGH 12:34:50.49
```

When the ac current returns to an in-tolerance range following a surge condition, a message such as the following is printed:

626

```
2 NORM 12:34:51.59
  135.2 A MAX
  SURGE 1.10 SEC
```

626A,G,R,ARA

```
  SURGE 1.10 SEC
  135.2 A MAX
2 NORM 12:34:51.59
```

The time when the current level returned to its in-tolerance range is printed, as well as the maximum current reached, and the duration of the surge.

2.6.5 Current Sag

A current sag is defined as a line current which decreases below the user-selected lower limit and then returns to an in-tolerance range in less than 2.56 seconds. When a sag begins, its starting time is printed as follows:

```
2 LOW  12:34:54.45
```

When the ac current returns to an in-tolerance range following a sag condition, a message such as the following is printed:

626

```
2 NORM 12:34:55.45
  104.5 A MIN
  SAG   1.10 SEC
```

626A,G,R,ARA

```
  SAG 1.10 SEC
  104.5 A MIN
2 NORM 12:34:55.45
```

The time when the current level returned to its in-tolerance range is printed, as well as the minimum current reached and the duration of the sag.

2.6.6 Impulse Disturbances

"Impulse" disturbances (spikes) represent any line perturbation which contains frequency components within the 300 Hz to 500 kHz range. An impulse type disturbance produces a printout such as the following:

626

```
2 IMP  10:12:13.45
  +0139 A PK
```

626A,G,R,ARA

```
  +0139 A PK
2 IMP 10:12:13.45
```

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This printout indicates that an impulse, which deviated from normal ac current by +139 amps peak, was detected on channel 2 at the time shown.

2.7 PRINTOUT MODES

The setting of the PRINTOUT MODE key switch on the front panel of the Mainframe determines the amount of detail which is printed out. The amount of detail ranges from a minimum amount with the key switch set in the "SUMMARY ONLY" position, to a maximum amount with the key switch set at "MAXIMUM DETAIL". The "OUT-OF-LIMITS ONLY" and "NORMAL" positions are the intermediate detail settings.

The example printouts on the next several pages illustrate how various settings of the PRINTOUT MODE key switch change the amount of detail in the printed recording of an overcurrent and current sag disturbance. For the examples, assume the disturbances occurred in channel 2, and the limits for channel 2 were programmed as follows:

SENSITIVITY	002 A
LOW LIMIT	105 A
HIGH LIMIT	125 A
RANGE F.S.	150 A

The following example printouts are referenced to figures 2-3 and 2-4 which illustrate an overcurrent and current sag disturbance.

Disturbances which occur while the PRINTOUT MODE key switch is in the "SUMMARY ONLY" position, do not generate individual printouts, but are stored in the daily accumulator and are automatically printed out each day at midnight. The contents of the daily accumulator may be manually triggered at any time by depressing the [DATA] push button.

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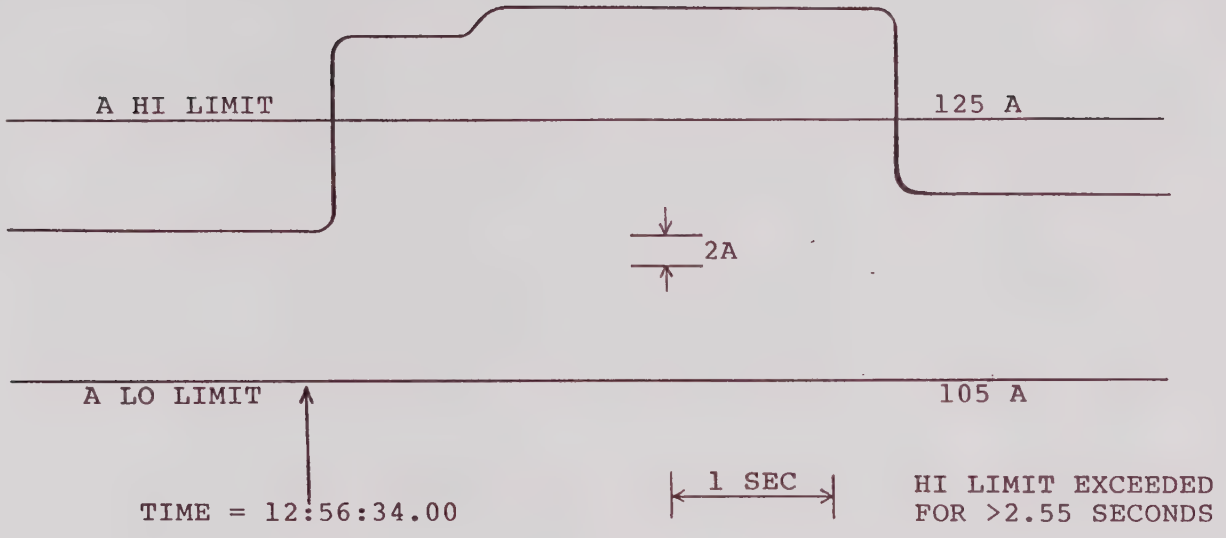

Figure 2-3. Overcurrent Disturbance (6005)

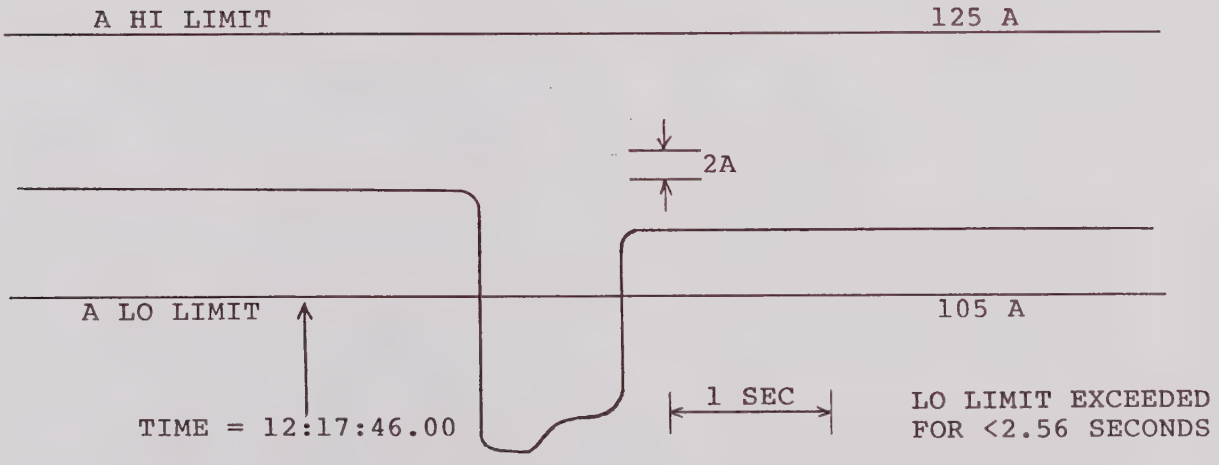

Figure 2-4. Current Sag Disturbance (6005)

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Printout of overcurrent (fig 2-3) in "OUT-OF-LIMITS" mode.

626

```
2 NORM 12:56:38.51
  139.1 A MAX

2 HIGH 12:56:34.21
```

626A,G,R,ARA

```
2 HIGH 12:56:34.21

  139.1 A MAX
2 NORM 12:56:38.51
```

Note that in the above printout, the time when the overcurrent was recorded is displayed (HIGH). When the current fell back to its in-tolerance range, the time was displayed along with the maximum current achieved. This is a typical display of an overcurrent while the unit is set in the "OUT-OF-LIMITS ONLY" mode.

Printout of overcurrent in "NORMAL" mode.

626

```
2 NORM 12:56:38.51
  139.1 A MAX

2 DEC  12:56:38.50
  130.2A

2 INC  12:56:35.78
  137.3A

2 INC  12:56:35.62
  135.3A

2 INC  12:56:35.40
  133.3A

2 INC  12:56:34.22
  131.3A

2 INC  12:56:34.21
  129.2A

2 HIGH 12:56:34.21
```

626A,G,R,ARA

```
2 HIGH 12:56:34.21

  129.2A
2 INC 12:56:34.21

  131.3A
2 INC 12:56:34.22

  133.3A
2 INC 12:56:35.40

  135.3A
2 INC 12:56:35.62

  137.3A
2 INC 12:56:35.78

  130.2A
2 DEC 12:56:38.50

  139.1A MAX
2 NORM 12:56:38.51
```

Note that in the above printout, and unlike the printout at the top of the page, any increase or decrease of 2 amps or more while the current is out-of-limits (out of in-tolerance), is displayed along with the time. This is a typical display of an overcurrent while the unit is set in the "NORMAL" mode.

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Printout of overcurrent (fig 2-3) in "MAXIMUM DETAIL" mode.

626

```
2 DEC  12:56:38.61
  119.8A

2 DEC  12:56:38.53
  121.8A

2 DEC  12:56:38.51
  124.0A

2 NORM 12:56:38.51
  139.1 A MAX

2 DEC  12:56:38.50
  130.2A

2 INC  12:56:35.78
  137.3A

2 INC  12:56:35.62
  135.3A

2 INC  12:56:35.40
  133.3A

2 INC  12:56:34.22
  131.3A

2 INC  12:56:34.21
  129.2A

2 HIGH 12:56:34.21

2 INC  12:56:34.30
  121.1A

2 INC  12:50:12.34
  119.0A
```

626A,G,R,ARA

```
  119.0A
2 INC 12:50:12.34

  121.1A
2 INC 12:56:34.30

2 HIGH 12:56:34.21

  129.2A
2 INC 12:56:34.21

  131.3A
2 INC 12:56:34.22

  133.3A
2 INC 12:56:35.40

  135.3A
2 INC 12:56:35.62

  137.3A
2 INC 12:56:35.78

  130.2A
2 DEC 12:56:38.50

  139.1 A MAX
2 NORM 12:56:38.51

  124.0A
2 DEC 12:56:38.51

  121.8A
2 DEC 12:56:38.53

  119.8A
2 DEC 12:56:38.61
```

Note that in the above printout, the increases and decreases in the level of current between (HIGH) and (NORM) are printed. But unlike the "NORMAL" mode display, all of the increases and decreases in the level of current ($\leq$ 2 amps) are displayed, not just those above the HIGH LIMIT setting. This is a typical display of an overcurrent while the unit is set in the "MAXIMUM DETAIL" mode.

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Printout of current sag (fig 2-4) in "OUT-OF-LIMITS" mode.

626

```
2 NORM 12:17:48.61
  090.1 A MIN
  SAG 1.25 SEC

2 LOW  12:17:47.36
```

626A,G,R,ARA

```
2 LOW  12:17:47.36

  SAG 1.25 SEC
  090.1 A MIN
2 NORM 12:17:48.61
```

Note that the above printout takes the same format as the overcurrent display in the "OUT-OF-LIMITS ONLY" mode, with MIN replacing MAX, and LOW replacing HIGH. The duration of the sag is also displayed (SAG). This is a typical display of a sag while the unit is set in the "OUT-OF-LIMITS ONLY" mode.

Printout of current sag (fig 2-4) in "NORMAL" mode.

626

```
2 NORM 12:17:48.61
  090.1 A MIN
  SAG 1.25 SEC

2 INC  12:17:48.60
  103.1A

2 INC  12:17:48.55
  098.0A

2 INC  12:17:48.05
  096.0A

2 INC  12:17:47.96
  094.0A

2 DEC  12:17:47.39
  091.9A

2 DEC  12:17:47.37
  094.1A

2 DEC  12:17:47.36
  101.3A

2 LOW 12:17:47.36
```

626A,G,R,ARA

```
2 LOW 12:17:47.36

  101.3A
2 DEC 12:17:47.36

  094.1A
2 DEC 12:17:47.37

  091.9A
2 DEC 12:17:47.39

  094.0A
2 INC 12:17:47.96

  096.0A
2 INC 12:17:48.05

  098.0A
2 INC 12:17:48.55

  103.1A
2 INC 12:17:48.60

  SAG 1.25 SEC
  090.1 A MIN
2 NORM 12:17:48.61
```

Note that the above printout takes the same format as the overcurrent display in the "NORMAL" mode, with MIN replacing MAX, and LOW replacing HIGH. The duration of the sag is also displayed (SAG). This is a typical display of a sag while the unit is set in the "NORMAL" mode.

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Printout of current sag (fig 2-4) in "MAXIMUM DETAIL" mode.

626

```
2 INC  12:17:48.86
  112.1A

2 INC  12:17:48.69
  110.1A

2 INC  12:17:48.62
  108.1A

2 INC  12:17:48.61
  105.9A

2 NORM 12:17:48.61
  090.1 A MIN
  SAG 1.25 SEC

2 INC  12:17:48.60
  103.1A

2 INC  12:17:48.55
  098.0A

2 INC  12:17:48.05
  096.0A

2 INC  12:17:47.96
  094.0A

2 DEC  12:17:47.39
  091.9A

2 DEC  12:17:47.37
  094.1A

2 DEC  12:17:47.36
  101.3A

2 LOW  12:17:47.36

2 DEC  12:17:47.35
  110.8A

2 INC  12:16:32.15
  113.0A
```

626A,G,R,ARA

```
  113.0A
2 INC 12:16:32.15

  110.8A
2 DEC 12:17:47.35

2 LOW 12:17:47.36

  101.3A
2 DEC 12:17:47.36

  094.1A
2 DEC 12:17:47.37

  091.9A
2 DEC 12:17:47.39

  094.0A
2 INC 12:17:47.96

  096.0A
2 INC 12:17:48.05

  098.0A
2 INC 12:17:48.55

  103.1A
2 INC 12:17:48.60

  SAG 1.25 SEC
  090.1 A MIN
2 NORM 12:17:48.61

  105.9A
2 INC 12:17:48.61

  108.1A
2 INC 12:17:48.62

  110.1A
2 INC 12:17:48.69

  112.1A
2 INC 12:17:48.86
```

Note that the above printout takes the same format as the over-current display in the "MAXIMUM DETAIL" mode, with LOW replacing HIGH and MIN replacing MAX. This is a typical display of a sag while the unit is in the "MAXIMUM DETAIL" mode.

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SECTION III
OPERATIONAL TEST

3.1 GENERAL

This section provides information for performing an operational test to verify that the 6005 plug-in is operating properly.

3.2 SYSTEM CHECK

1) Turn the PRINTOUT MODE key momentarily to the "SYSTEM CHECK" position, and then back to "NORMAL".

A source of precise signals is applied to the front-end circuitry of the plug-in. Any inputs connected at this time will be automatically disconnected for the duration of the system check. The signals fully verify the plug-in module's operational integrity.

2) Compare the actual displayed readings with those in p par. 3.2.2 below. If any readings are out of range, contact the Dranetz Customer Service Department. (See par 1.10, FACTORY REPAIR).

3.2.1 System Check Signals Example

The following example printout illustrates the nominal values for the impulse (IMP) and current (PRESENT A). Note that these values (10A, and 150 A PK) are within the listed tolerances. When performing a system check, any values obtained which are within the given tolerances verify the operation of the 6005 plug-in.

626

```
******************
PRESENT A 010.0A
IMP   + 0150 A PK
   626-PA-6005
       CH #

01/17/85  16:29:54
***SYSTEM CHECK***
```

626A,G,R,ARA

```
***SYSTEM CHECK***
01/17/85  16:29:54

       CH #
   626-PA-6005
IMP   + 0150 A PK
PRESENT A 010.0A
******************
```

3.2.2 System Check Tolerances

F.S. Range	Impulse	Current
75	137 to 162 A pk	9.6 to 10.6 A
150	132 to 167 A pk	9.2 to 10.8 A
300	122 to 177 A pk	8.4 to 11.6 A

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